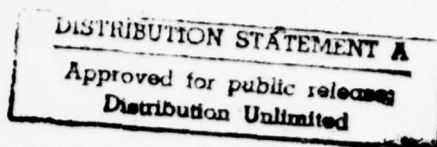


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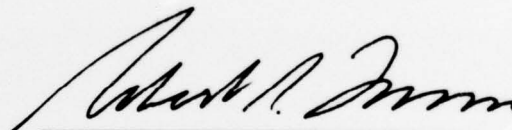
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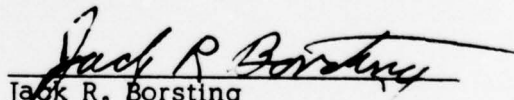
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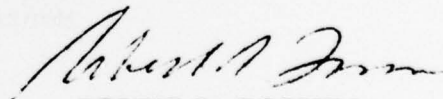
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Multi-Phase-Mission Reliability
of Maintained Systems

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B.S., Purdue University, 1962
M.S., Naval Postgraduate School, 1969

In a phased mission the functional organization of the system changes at selected times which mark the boundaries of the phases of the mission. Existing methods for analysis of phased missions are modified and extended to permit determination of the reliability of maintained systems. Results are first obtained for the case when maintenance is performed only during a standby period, called the operational readiness phase, during which the system functions solely to maintain its readiness for a later period of active operations, as is the case for strategic weapons and safety devices. These results are then extended to systems which perform complex multi-objective missions to permit assessment of system performance at levels intermediate between total failure and total success. The reliability of systems which are maintained throughout a multi-phase mission is also considered. Two bounds on system reliability are developed--one based on the within-phase reliability of the system and the other on the phase minimal cut sets. Compatible lower bounds on the reliability of phase minimal cut (parallel) systems of independent components with exponential failure and repair times are considered.

Doctor of Philosophy
December 1975

Advisor: James D. Esary
Department of Operations
Research and Administrative
Sciences

Transonic Thermal Blooming

Edwin Fenton Carey, Jr.

Lieutenant Commander, United States Navy

B.M.A.E., University of Delaware, 1967

M.M.A.E., University of Delaware, 1970

According to the linearized solutions for thermal blooming, the density perturbations become infinite (i.e. "catastrophic" defocusing) as the Mach number approaches unity. However, the nonlinearities in the transonic equations cutoff the trend to infinity, and the values of the flow perturbation quantities are finite. The nonlinear equations with heat addition are transformed into simple linear algebraic equations through the specification of the streamline geometry in the heat release region. At a Mach number of unity, streamtube area variation was found to be directly proportional to the change in total temperature. A steady, two-dimensional mixed flow solution has been found for the transonic thermal blooming problem. The solution for the density perturbations within a laser beam at a Mach number of precisely unity is given. For a Gaussian beam with an intensity of 3.333×10^7 Watts/m² and an atmospheric absorption of 8.0×10^{-7} cm⁻¹ the maximum fractional density perturbation is 1.028×10^{-6} . The transonic thermal blooming problem does not pose as serious a problem as previously anticipated.

Doctor of Philosophy
March 1976

Thesis Advisor: A. E. Fuhs
Mechanical Engineering
Department

A COMPUTER ANALYSIS FOR THE DETERMINATION
OF ELECTRODE VOLTAGE LOSSES
IN MAGNETOHYDRODYNAMIC-GENERATOR PLASMAS

Richard Charles Dolson
Lieutenant, United States Navy
B.S., Purdue University, 1966
M.S., Naval Postgraduate School, 1973

This work investigates the nature and extent of the voltage drops in the vicinity of MHD non-emitting electrodes, especially the losses attributable to the sheath. The non-existence of a one-dimensional sheath solution is proved and a computer model with two-dimensional, periodic active sites representing a flat plate electrode is developed. The sheath and ambipolar regions evolve from the same set of equations in a self-consistent way, obviating the requirement to match boundary conditions between the regions. With this model the effects of a magnetic field and Joule heating are studied. Results are compared with experimental observations. To supplement the sheath investigation a peripheral study of the boundary layer voltage losses has been made and a relatively simple technique for determining these losses is presented.

Doctor of Philosophy
December 1975

Thesis Advisor: O. Biblarz
Aeronautics
Department

A NORMAL MODE MODEL FOR ESTIMATING LOW-FREQUENCY
ACOUSTIC TRANSMISSION LOSS IN THE DEEP OCEAN

Kirk Eden Evans
Lieutenant Commander, United States Navy
B.A., Miami University, 1966
M.S., Naval Postgraduate School, 1973

This work describes a computer model (QMODE) which uses the normal mode method for the estimation of low-frequency long-range acoustic transmission loss in the deep ocean. Wentzel-Kramer-Brillouin (WKB) solutions for the phase speeds (eigenvalues) and modes (eigenfunctions). The WKB solutions are extended to consider the effects of the surface and bottom boundaries. The eigenvalues are initially estimated by a least-squares polynomial fit through sample results of the WKB characteristic equation. The effects of range dependence in the sound speed profile are simulated through the use of the adiabatic assumption, which has been extended to include the case of profiles with multiple sound channels. Results of the model agree generally with the transmission loss observed in two long-range acoustic experiments.

Doctor of Philosophy
September 1975

Advisor: Alan B. Coppens
Physics and Chemistry
Department

Structures, Analysis and Design
of N-Dimensional Recursive
Digital Filters

Lennart Souchon
Kapitanleutnant, Deutsche Marine
B.S.E.E., Naval Postgraduate School, 1972
M.S.E.E., Naval Postgraduate School, 1973

Formulas for the general term of the Taylor series expansion (impulse response) of a multidimensional recursive digital filter are developed. Of particular interest is a non-recursive combinatorial formulation involving the filter coefficients. These results are applied to develop several new specific stability criteria for low order two-dimensional filters, as well as for the development of some general filter design procedures to achieve a desired impulse response. Also included are some new filter structures and stability conditions for N-dimensional filters.

Doctor of Philosophy
December 1975

Thesis Advisor: S. R. Parker

The Development of an Optically Active Laser
Schlieren System with Application to
High Pressure Solid Propellant Combustion

James Randolph Andrews
Lieutenant Commander, United States Navy
B.S.E.S., Naval Postgraduate School, 1970
M.S.A.E., Naval Postgraduate School, 1974

A laser schlieren system, using an optically active single-piece quartz prism-polaroid sheet combination aperture in place of the conventional knife edge, was developed and applied to high pressure solid propellant combustion studies. Advantages and limitations of the system are discussed. Ammonium perchlorate deflagration was observed to pressures of 2500 psi. Distinct surface reaction sites were evidenced in the gas phase at high and low pressures by alternating density gradients across the surface. These sites were found to be very small or nonexistent at intermediate pressures.

Aeronautical Engineer
September 1975

Thesis Advisor: D.W. Netzer
Aeronautics
Department

SIMULTANEOUS IDENTIFICATION OF SHORT PERIOD AND PHUGOID
STABILITY PARAMETERS USING AN ADVANCED MAXIMUM LIKELIHOOD
METHOD

Frederick T. Bryan
Major United States Marine Corps
B.S.B.A., Boston College 1963
M.S.A.E., Naval Postgraduate School, 1974

An investigation was conducted to determine the feasibility of obtaining the short period and phugoid stability derivatives from one maneuver, "simultaneously". It was concluded that the maximum likelihood identification program SCIDNT I showed great promise in obtaining the short period and phugoid stability derivatives from one maneuver. Extraction of the short period stability parameters in the presence of the phugoid was easy, straight forward, and yielded results similar to those obtained from pure short period data. Estimation of the phugoid stability parameters was possible when they were estimated in conjunction with Z , X , M , and θ . It was recommended that a new set of data be obtained at a flight condition where the phugoid is at least moderately damped and that this data be analyzed to resolve the present anomalies.

Aeronautical Engineer
December 1975

Advisor: Ronald A. Hess
Department of
Aeronautics

A Comparison of Buffer Strip and Non-Buffer
Strip Joint Designs

James Michael Gill
Lieutenant Commander, United States Navy
B.Ae., University of Minnesota, 1965
M.S., Naval Postgraduate School, 1975

Buffer strip and non-buffer strip bolted wing skin type joints made from NARMCO 5203/T300 graphite-epoxy material were designed, and the excess bearing capacity and weight of these joints were calculated for a wide range of laminate compositions, bolt hole sizes, and number of bolt holes. Design load conditions representative of an advanced fighter type aircraft were chosen. Joint designs were arbitrarily restrained by assumed manufacturing conditions, assumed interface conditions, and imposed laminate composition restrictions. Charts were prepared from which relative joint efficiencies could be determined but no attempt was made to analyze the effect of the arbitrary design restrictions. The advantages and penalties for buffer strip design were discussed and recommendations for future studies were made.

Aeronautical Engineer
June 1976

Advisor: Milton H. Bank II
Department of
Aeronautics

On the Stability of Poiseuille Flow

William Francis Harrison
Lieutenant, United States Navy
B.S., Rensselaer Polytechnic Institute, 1966

The three-dimensional linearized vorticity transport equations for plane and pipe Poiseuille flow were studied using a highly generalized complex exponential form of solution in both space and time. The stability of these flows was examined using frames of reference which move with the fluid particles.

Numerical results for plane Poiseuille flow show that the critical Reynolds number is lowered by the introduction of streamwise spatial decay. This result provides a new basis for improving the agreement between theory and experiment. Numerical results for pipe flow were not obtained due to a probable error in some detail of the analysis or numerical method.

Aeronautical Engineer
September 1975

Advisor: T. H. Gawain
Department of
Aeronautics

Flow Visualization of the Turbulent Jet at the Exit of a
Single Element Nozzle by Holographic Technique, and Mean
Velocity Profile Measurements with a Laser Doppler
Anemometer

Ijaz Ahmad Malik
Flight Lieutenant, Pakistan Air Force
B.E., Karachi University, 1970

The successful application of the holographic technique for flow visualization is reported. The investigation was conducted on the turbulent jet at the exit of a single element oscillating jet nozzle. Both single and double exposure holographic interferograms were employed to determine for an unsteady (oscillating) turbulent jet, the jet structure, spreading rates and the flapping phenomenon. The structure of the steady jet was also investigated for comparison purposes. The mean velocity profile measurements of the oscillating and non-oscillating jet were also made with the help of a laser Doppler anemometer and results were compared with the theory and published results obtained by other methods.

Aeronautical Engineer
March, 1976

Advisor: Daniel J. Collins
Department of
Aeronautics

Lifting Surface Theory For
Wings of Arbitrary Planform

John Leroy Parks

Lieutenant Commander, United States Naval Reserve
B.S., United States Naval Academy, 1963

This theory permits the calculation of pressure distributions over a thin airfoil in steady, inviscid, incompressible flow; or given a desired chordwise pressure distribution the camber line of an ideal wing can be determined. The method treats the circulation about the wing as a continuous vortex sheet of variable strength covering the wing planform and trailing downstream to infinity. The results of the present numerical solution for the pressure distribution solution are not satisfactory. However the solution for the camber line of an ideal wing are in reasonable agreement with published two dimensional results.

Aeronautical Engineer
March 1976

Advisor: T.H. Gawain
Department of
Aeronautics

An Experimental Investigation of Microstrip
Transmission Line and Coplanar Waveguide
on Ferrite Substrate

Hooshang Aminelahi
Commander, Iranian Navy
Diploma in Electrical Engineering, Faraday House
Engineering College, London, 1962
B.S.E.E., Naval Postgraduate School, 1975
M.S.E.E., Naval Postgraduate School, 1975

In this thesis both a microstrip transmission line and a coplanar waveguide on ferrite substrate were designed, constructed and tested. The behavior of microstrip and coplanar waveguide was experimentally evaluated, using different biasing magnetic fields and directions. The experimental dispersion (ω - β) and attenuation diagrams for both structures were compared with theoretical work based on perturbation theory. Also, the experimental results were compared with the existing work conducted by different authors.

Electrical Engineer
June 1976

Advisor: Jeffery B. Knorr
Department of
Electrical
Engineering

ELECTRONIC WARFARE TECHNOLOGY

Raul Pereira Eittencourt
Lieutenant Commander, Brazilian Navy
M.S.E.E., Naval Postgraduate School, 1975

An analysis of the modern technology employed in Electronic Warfare systems is carried out. Electronic and optical techniques presently used in the detection, localization, processing and identification of signals, linked with active and passive countermeasures and counterccountermeasures, are analyzed. "Real-world" designs and configurations are discussed with respect to effectiveness, reliability and design and operational trade-offs. Topics are divided according the modern classification of Electronic Warfare, covering confusion reflectors, masking and deceiver jammers, intercept receivers as well as the new field of Electro-Optical Electronic Warfare. Special characteristics inherent to the Surface Navy are pointed out. In the Appendices, the experiment of a circuit devised to be useful in signal recognition is described, and a list of missiles with electronic and guidance characteristics is presented.

Electrical Engineer
June 1976

Advisor: Donald A. Stentz
Electrical Engineering
Department

Measurement of Surface Current
Distribution on a Planar Cross

Thomas Robertson Campbell
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1964

This thesis describes the development of a system to measure quasi-static current distributions on a planar surface utilizing shielded loop current probes. The system was then utilized in an attempt to measure surface current distribution at a four conductor junction using the surface of a flat metal cross as finite junction model. Three distinct configurations of current feed to the junction were investigated and the experimental results are presented. Experimental apparatus design inconsistencies and consequent impact on experimental data resulted in somewhat imprecise results.

Electrical Engineer
December 1975

Advisor: Richard W. Adler
Electrical Engineering
Department

A Digital Automatic Frequency Control Design

Glenn Everette Ewing
Lieutenant, United States Navy
B.S., United States Naval Academy, 1967

This paper describes a digital automatic frequency control (AFC) system designed for use with almost any conventionally-tuned, high-frequency communications equipment. When connected to a high-quality equipment, such as an R-390 receiver, frequency accuracy and stability approaching that of frequency synthesizers can be obtained.

The AFC system digitally counts the frequency of all frequency-determining oscillators in the controlled equipment, computes and displays the operating frequency to the nearest Hertz. When the AFC is engaged, any deviation of the computed operating frequency from the desired frequency causes an error correction voltage to be generated. Use of this system requires that the controlled equipment be modified for voltage trimming of the tuning oscillator.

Electrical Engineer
March, 1976

Advisor: Richard W. Adler
Electrical Engineering
Department

Thermographic Imaging of Electromagnetic Fields

Claude Andrews La Varre
Lieutenant Commander, United States Navy
M.S., Naval Postgraduate School

It is recognized that a means of converting electromagnetic fields into visible images would greatly simplify the problem of designing structures to optimize their compatibility with such fields.

Two needs must be met to allow such visualization. First, the fields must be transduced into a phenomenon which is capable of being imaged. Second, there must exist a sensor which senses that phenomenon and generates an image visible to the human eye.

The bulk of this work was to investigate the parameters and limitations of one possible imaging procedure, called Dye Transfer Modulation (DTM).

On the basis of that work and the development of a new sensor, the AGA Thermovision device was recognized as an exciting alternative to DTM. A brief investigation of its potential was conducted and is presented herein.

Electrical Engineer
December 1975

Advisor: Robert W. Burton
Electrical Engineering
Department

COMPUTER AIDED CONTROL SYSTEM DESIGN USING FREQUENCY
DOMAIN SPECIFICATIONS

Anthony Joseph Mancini
Lieutenant United States Navy
E.S.E.E., University of Oklahoma, 1970
M.S.E.E., Naval Postgraduate School, 1975

The primary intent of this work is to investigate computer aided compensator design using classical frequency response techniques in conjunction with the techniques of modern mathematical programming. A computer program to perform the automated design task is presented. This particular algorithm is based on the constrained optimization technique introduced by M. J. Box.

In particular, the desired open loop frequency response is specified for a number of discrete frequency points over the frequency range of interest. Then the minimization routine is used to vary the compensator parameters in such a manner as to minimize a cost functional based on the difference between the actual and desired open loop frequency response of the compensated system. To illustrate the algorithm several detailed examples using the program are presented.

Degree of
Electrical Engineer
June 1976

Advisor: Dr. G. J. Thaler
Elect. Engr.
Department

Detectability of a Single Sideband Spread
Spectrum Radio Signal

Richard Allan Pettus
Lieutenant, United States Navy
B.S., University of Missouri at Rolla, 1968
M.S., Naval Postgraduate School, 1975

A frequent requirement of spread spectrum communications is that the transmitted signal not be easily detected by an uncooperative receiver. If, however, single sideband amplitude modulation by a digital signal is used to achieve spectrum spreading, it is shown that peaks occur in the transmitted waveform. These peaks may be detected with a threshold receiver.

The peak level dependence on bandwidth of the transmitted signal is presented. The effect of bandwidth and gaussian noise on probability of detection are considered in a statistical analysis using numerical methods.

The analysis demonstrates the susceptibility of the waveform peaks to detection for a variety of bandwidths and noise levels. Results are presented in both graphical and tabular form.

Electrical Engineer
December 1975

Advisor: Glen Myers
Department of Electrical
Engineering

Electrical Characteristics
Of
Monopole Antennas
Above a Rectangular Prism

Charles Thomas Ristorcelli
Lieutenant, United States Navy
B.S., Northrop Institute of Technology, 1968

A scaled model of an idealized ship superstructure was used to support an electrically thin radiating monopole antenna. The surface charge and current distributions on the antenna were measured, and with the resulting data, the antenna's apparent admittance was calculated. The procedures for measurements of surface distributions on antennas were then modified to permit similar measurements on flat metallic surfaces, and with the modified techniques the surface charge and current distributions were obtained for the vertical sides of the model superstructure.

The results of the measurements provide benchmark data for use in connection with the application of numerical techniques for the analysis of geometrical configurations similar to the model used in the experiment.

Electrical Engineer
December 1975

Advisor: R. W. Adler
Electrical
Engineering
Department

Theoretical Analysis of a Model
for
a Field Displacement Isolator

Ram Sharon
Lieutenant Junior Grade, Israeli Navy
B.S.E.E., 'Technion' High Technological Institute, Israel, 1972
M.S.E.E. (with distinc.), Naval Postgraduate School, 1975

A frequency dependent analysis of a shielded edge-guided mode isolator is presented. A Fourier transform technique is applied to the boundary expressions of a structure built on a dielectric substrate, and the resulting equations are solved for the wavelength ratio. By using perturbation analysis and the results obtained for the dielectric case, solutions for the normalized propagation constant and attenuation for waves traveling in the $-Z$ and $+Z$ directions, in a structure built on a ferrite substrate, are obtained.

Electrical Engineer
June 1976

Advisor: J. B. Knorr
Electrical
Engineering
Department

Solid State Applications
of Direct Energy Conversion and Heat Pumping
For a Small Automotive Vehicle

Thomas Constantine Tsoukalas
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1964
M.S., Naval Postgraduate School, 1974

The feasibility of solid state application for electrical power generation and heat pumping in small automotive vehicles has been examined. A new geometric configuration for the thermoelectric couple was introduced and the heat flow problem has been solved analytically in detail. The obtained results appeared promising for future developments in this area.

Electrical Engineer
September 1975

Thesis Advisor: M.L. Wilcox
Electrical Engineering
Department

Sampled Data Adaptive Digital Computer Control
of
Surface Ship Maneuvers

John Joseph Uhrin III
Lieutenant, United States Navy
E.E.E., Villanova University, 1967
M.S., Naval Postgraduate School, 1975

The replenishment at sea (RAS) maneuver is studied in detail for heading and speed control. Design of purposefully nonlinear control laws is accomplished for the Mariner hull using the linearized equations of motion in three degrees of freedom. Extensive use of low order modeling and optimal control theory was made. Procedure steps are presented in detail to facilitate redesign for other ship types. The results are verified using DSI simulation for a number of possible RAS scenarios. The control systems are also tested in a sea state to insure proper operation in the presence of external perturbations.

Electrical Engineer
June 1976

Advisor: George J. Thaler
Electrical Engineering
Department

Transient Thermal Stress Analysis
of Composite Structures Including
Continuously Varying Properties

Richard Bailey Bubeck
Lieutenant, United States Navy
B.A., University of Virginia, 1967

Calculations of transient thermal stress levels were made for composite coatings of hollow cylinders. Stress analysis was done during a thermal cycle of successive heating and cooling periods. Various coating configurations were investigated. The results showed the effect of changes in coating arrangements and the failure modes due to the excessive stress levels.

Solutions were obtained by approximate techniques, and a computer program for transient three dimensional thermal stress analysis was developed. The finite element technique was employed for the determination of the temperature distribution and the elastic stress analysis. Fortran IV G Level was used as the programming language.

Mechanical Engineer and
Master of Science in
Mechanical Engineering
September 1975

Thesis Advisors: P. Pucci
G. Cantin
Mechanical Engineering
Department

Transverse Forces on Smooth and Rough Cylinders
in Harmonic Flow at High Reynolds Numbers

Neil Jon Collins
Lieutenant, United States Navy
B.S., University of Massachusetts, Amherst, 1969

The transverse forces acting on smooth and sand-roughened circular cylinders immersed in an harmonically oscillating flow have been measured using a recently constructed U-shaped water tunnel.

The lift coefficient and the frequency of the alternating force have been determined. For smooth cylinders, the lift coefficients were found to depend on both the Reynolds and the Keulegan-Carpenter numbers for Reynolds numbers between about 20,000 and 150,000. For rough cylinders, the lift coefficients were found to be independent of the Reynolds number within the range of relative roughnesses and Reynolds numbers tested. The results have also shown that the lift coefficients for smooth cylinders at low Reynolds numbers are nearly identical with those obtained for rough cylinders at very high Reynolds numbers at the corresponding amplitude ratios. For both rough and smooth cylinders, the transverse force is a significant fraction of the in-line force and must be taken into consideration in the design of structures.

It is recommended that the experiments be extended to the self-excited hydro-elastic oscillations of cylinders in harmonic flows.

Master of Science in
Mechanical Engineering and the
degree of Mechanical Engineer
June 1976

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

Beams on Nonlinear Foundations

Vo Thanh Tam

The solution of a beam on an elastic nonlinear foundation by the Finite Element Method is presented in this thesis. Discontinuous (Winkler) and continuous foundations are considered. The general formulation is based on the Galerkin method. The solution technique for the linear case uses Gauss elimination and the solution technique for the nonlinear case is based on Brown's method (a modified Newton-Raphson). Some illustrative examples are presented. A brief comparison of continuous and non-continuous foundations is made.

Mechanical Engineer and
Master of Science in
Mechanical Engineering
September 1975

Advisor: David Salinas
Department of Mechanical
Engineering

Nucleation and Growth of
Anodic Electrocrystallized Products
on Ship Hull Zinc in Salt Water Solutions

James M. Todd
Lieutenant, United States Navy
B.S., United States Merchant Marine Academy, 1968

The structure of corrosion products formed on a zinc alloy with and without a steel couple and exposed in various salt water electrolytes was studied as a function of time. A film growth mechanism is hypothesized involving nucleation of ZnO platelets in a near-surface electrolyte layer adjacent to anodic areas. Inclusion areas on the zinc surface are lead-rich corrosion product initiation points, and a passivating film tends to form over these areas. Hexagonal ZnO platelets are the primary corrosion product with secondary products categorized and presented. X-ray diffraction powder patterns suggest a ZnCO_3 product and a ZnCl_2 complex product in the base film.

Master of Science in
Mechanical Engineering
and Mechanical Engineer
December 1975

Advisor: A. J. Perkins
Mechanical
Engineering
Department

Moire Pattern Analysis
of
Strain

Clarke Mullen Bruce
Lieutenant, United States Navy
B.S., North Carolina State University, 1967

Moire techniques were made available at the Naval Postgraduate School and applied to the determination of the maximum stress at the edge of a hole in a finite plate. The moire method yields full-field information of the in-plane surface displacements. The total cost to acquire this capability was less than \$100.00.

Master of Science in
Aeronautical Engineering
September 1975

Advisor: Milton H. Bank
Aeronautics
Department

Ballistic Range Development

Thomas James Davis
Lieutenant, United States Navy
B.A., North Texas State University, 1968

A ballistic range was developed for use in testing structural materials. High velocity and low velocity guns were investigated. Charge values for various projectile weights were determined and velocity consistency and reproducibility were verified. A range notebook was compiled with necessary user information and test results.

Master of Science in
Aeronautical Engineering
June 1976

Advisor: M. H. Bank
Department of Aeronautics

Development of a Temperature-Pneumatic
Probe and Application at the Rotor Exit
in a Transonic Compressor

Frederick James Dodge
Lieutenant, United States Navy
B.S., University of Oregon, 1969

The development is reported of a new combination temperature-pneumatic probe specifically to determine the blade element performance of the rotor in a transonic compressor. The design incorporates a fine wire thermocouple sensor which provides a measure of temperature rise that is insensitive to Mach number. With simultaneous measurements from four pneumatic sensors, the velocity vector was determined locally in radial surveys downstream of the compressor rotor. The probe was calibrated in a free jet. The calibration measurements were reduced to a set of equations to allow off-line reduction of compressor measurements using a Hewlett-Packard Model 9830A calculator and peripherals. The design, development, calibration, and application of the probe are described and initial results of measurements in the compressor are given.

Master of Science in
Aeronautical Engineering
June 1976

Thesis Advisor: R.P. Shreeve
Aeronautics Department

An Analysis of the Effect of a
Flight Director on Pilot Performance
in a Helicopter Hovering Task

Timothy William Duffy
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

A fixed-base simulator evaluation of a flight director for maintaining longitudinal control of a helicopter in the hover mode of operation was made. Test subjects performed ninety-second precision hovering tasks utilizing two cockpit displays. The second display differed from the first only by the addition of the flight director indicator. The helicopter and each display were simulated on a hybrid computer. The hovering task consisted of minimizing root mean square longitudinal and vertical deviation from an initial equilibrium position. Root mean square performance data and numerical pilot opinion ratings were obtained. These data indicated significant improvement in performance when the flight director was being utilized.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: Ronald A. Hess
Aeronautics
Department

Design of a Repeater-Jammer Experiment
for
A Monopulse Radar

Michael Joseph Duncan
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

A current problem of interest in the Electronic Counter-Measures field is the deception of monopulse type radars. The operational evaluation of any deception device requires that some preliminary work be accomplished in order to establish what electronic devices are most suitable for the job and what specific parameters these devices must meet. This paper investigates the feasibility of installing a monopulse deception repeater on board a steel-hulled ship, the RV ACANIA. The specific parameters investigated are the peak power required for deception and the electronic gain required of the repeater loops. Prior to calculation of these parameters it was necessary to determine the radar cross section of the ship test platform and to measure the antenna isolation to insure its adequacy to prevent destructive feedback of the repeater loops. Successful completion of these experiments enable one to specify that a traveling wave tube amplifier with a power output of 60 dBm and a gain of 53 dB would be an appropriate device for the loop amplifiers.

Master of Science in
Aeronautical Engineering
September 1975

Advisor: David B. Hoisington
Electrical Engineering
Department

Hydraulic Ram Effect
on
Composite Fuel Cell Entry Walls

Alfred Nicholas Duva Jr.
Lieutenant Commander, United States Navy
B.S., Fairleigh Dickinson University, 1965

Catastrophic failure of a partially filled aircraft fuel cell due to impact and penetration by a high speed projectile often occurs due to a phenomenon known as hydraulic ram. The structural response of the fuel tank walls to hydraulic ram should be of vital concern to the designers of aircraft fuel cells. Considerable research has been conducted to determine the effects of hydraulic ram on metallic fuel cells, but very little attention has been given to fuel cells made with the new advanced composite materials. The purpose of this research is to examine the various effects of hydraulic ram on a graphite/epoxy wall when subjected to penetration by a .222 caliber projectile. Eight hydraulic ram tests are made on a clamped 11-inch square plate 0.067 inches thick at projectile velocities between 2600 and 2800 fps. The engineering properties of the laminate are determined both analytically and experimentally. The low velocity shots caused only slight damage to the plate. At the higher velocities, the hydraulic ram caused considerable damage, including total severance of the plate from its clamped support over much of the outer perimeter. The results of this research illustrate the importance of the method of attachment of the composite wall at its boundaries.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: R. E. Ball
Department of Aeronautics

A Survey of the Pressure Distribution within
the Plenum Chamber of the XR-3 Testcraft

Rodman Michael Eddy
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1964

A pressure survey of the cavity (plenum chamber) was conducted on the XR-3 Surface Effect Ship (SES) Testcraft. The lowest pressures were observed at 15 knots, and the highest pressures at 21 knots. Pressure variations with velocity were observed to be similar in all cases, with a pressure decrease from 12 to 15 knots, an increase from 15 to 21 knots, a fluctuation and slight decrease from 21 to 24 knots, and a decrease from 24 to 26.5 knots. All pressures have been plotted to show graphically the pressure variation versus velocity and position within the plenum chamber from bow seal to stern seal, and from port side to starboard side. The shape and gradient of pressures was observed to vary directly with velocity.

Master of Science in
Aeronautical Engineering
September 1975

Advisor: Donald M. Layton
Department of
Aeronautics

A Study of the Failure of Joints in Composite
Material Fuel Cells Due to Hydraulic Ram Loading

Henry Speer Ezzard, Jr.
Ensign, United States Navy
B.S., United States Naval Academy, 1975

The objectives of this research were to show the relative importance of the transverse shearing forces, the bending moments, and the tensile forces produced by hydraulic ram loading on military aircraft fuel tank joint designs for composite materials, and to present fuel tank test section designs. With the use of a finite element analysis, it was shown that the transverse shearing force may be a major cause of attachment failure of composites, primarily by an unzipping or pull out mode of failure. It was also shown that failure criteria for transverse shearing stresses in composites are lacking. By comparing several specific aircraft design concepts, designs for a wing fuel test tank and a fuselage fuel test tank were selected. Simplicity, similarity to actual aircraft fuel tanks, and uniformity between experiments were primary considerations in the selection.

Master of Science in
Aeronautical Engineering
June 1976

Advisor: R. E. Ball
Aeronautics
Department

A Study of the Crack Damage in Fuel-Filled
Tank Walls Due to Ballistic Penetrators

Steven Lock Fahrenkrog
Lieutenant, United States Navy
B.A., Moorhead State College, 1969

A major goal of the hydraulic ram survivability program for aircraft fuel tanks is the development of analytical-numerical tools for the accurate prediction of damage to the tank due to a ballistic projectile. This report presents a method for predicting the amount of cracking of a penetrated tank wall due to the penetrating projectile and the hydraulic ram loading. The method uses computer codes to predict the fluid pressure on the wall and the stresses in the wall. The stresses are compared with empirical data on the fracture of thin cracked plates to obtain a prediction of the final crack length. A comparison of predicted cracks with actual cracks that occurred in plates tested by Naval Weapons Center, China Lake, California is included. Good correlation is obtained when the magnitude of the predicted strains is adjusted to agree with the magnitude of the measured strains by a correction factor.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: R. E. Ball
Department of Aeronautics

A Study of Boundary Layer and Mass Bleed in a Short
Length Supersonic Diffuser for a Gas Dynamic Laser

by

Paul Grimmer Habel
Lieutenant, United States Navy
B.S., University of Florida, 1967

This research was conducted to study the effect of boundary layer and mass bleed on the starting (i.e., establishment of supersonic flow) and running of a short length supersonic diffuser for a gas dynamic laser. A one-dimensional diffuser geometry which diffused the flow by an isentropic turn was laid out by the method of characteristics. Extensive boundary layer bleed holes and slots were incorporated in the diffuser walls. Self-actuating, one-way valves installed in the walls bled excess flow during starting. Schlieren flow visualization was obtained through opposite glass diffuser walls. The diffuser was started and Mach 3.5 flow established in a diffuser with a contraction ratio of 1.69. This geometry would not start without utilizing boundary layer and mass bleed. A mode of operation called self bleed was discovered. The lower static pressure in the diffuser entrance, via suitable ducting, was used to bleed the boundary layer in the diffuser throat. This method reduced the minimum operating stagnation pressure 17.0% without utilizing vacuum tanks or pumps. Testing confirmed that boundary layer bleed in the diffuser throat significantly lowers operating stagnation pressure.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: Allen E. Fuhs
Department of
Mechanical Engineering

An Investigation of the Flow in
Turbojet Test Cell Augmenters

Jack Douglas Hayes
Lieutenant, United States Navy
B.S.A.E., University of Colorado, 1967

A two-dimensional elliptic computer model was adapted to the solution of the flow field in a turbojet test cell section which contained the engine exhaust duct and augmentor tube. Various engine power settings, augmentation ratios, and augmentor geometries were investigated.

Flow visualization and static pressure recovery were primary objectives subject to specified engine power settings and augmentation ratios. Capabilities and limitations of the model are discussed.

Master of Science in
Aeronautical Engineering
September 1975

Thesis Advisor: D.W. Netzer
Aeronautics
Department

A Program for the Stability Analysis
of
Pipe Poiseuille Flow

Richard Howard Johnston III
Lieutenant, United States Navy
B.S., United States Naval Academy, 1967

Recent research by Harrison on the stability of parallel flows resulted in a successful solution of plane Poiseuille flow but produced unexplained anomalies for pipe flow. The purpose of the research in this paper was to find and correct errors in Harrison's initial analysis of the pipe flow problem.

A minor error in Harrison's numerical method was corrected. Moreover, it proved necessary to reanalyze the conditions on the axis of symmetry of the pipe. These changes finally made it possible to obtain reasonable results.

Owing to time limitations, the number of solutions obtained using the corrected program was sufficient only to confirm its general validity. However, the results obtained are significant in that they disclose instabilities which are known to exist but which have not been accounted for in previous theoretical investigations.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: Theodore H. Gawain
Department of
Aeronautics

Time-Sharing Effects On Pilot Tracking Performance

John Patrick Kennedy
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

Subjects were required to simultaneously perform a two-dimensional tracking task and respond to a set of lights with toggle switches. Five levels of difficulty and two stimulus presentation rates were involved in the secondary task. The purpose of the experiment was to examine time-sharing performance of experienced military pilots and to investigate differences in performance by pilots of different types of aircraft. Analysis of the data collected from 20 subjects showed that correlation between elements of a complex task is weak, performance levels drop as task load increases, and there was only one difference found between any of the pilot type groups. Dual-crew fighter/attack jet pilots took significantly longer to respond to stimuli when time-sharing.

Master of Science in
Aeronautical Engineering
September 1975

Advisor: Donald M. Layton
Department of
Aeronautics

The Effect of Rapid Raising of the
Bow Seal on Early Transition of the
XR-3 Captured Air Bubble Testcraft

Wayne Thomas Moore
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

A series of tests was conducted to determine the effects of rapid raising of the bow seal on the transition of the XR-3 captured air bubble testcraft.

The report contains a brief description of the testcraft, of the installed air spring seal, and seal position control mechanisms. A short description of the data gathering and reduction systems is also included.

The report then presents data in the form of bar graphs showing the thrust and velocity required for normal and bow-seal-raising transition. Finally, the conclusions that may be drawn from the data are presented.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: D. M. Layton
Aeronautics
Department

On the Stability
of
Plane Poiseuille Flow

Lewis Raymond Newby
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1964

The stability of plane Poiseuille flow was studied using theory developed by Harrison. A similarity transformation was introduced which reduces computation time and provides better insight into the basic relations. The stability of the flow was examined from a Lagrangian viewpoint. Instability was found to be progressive in nature and three distinct levels were identified, namely incipient, critical, and fully developed instability.

Results show that the critical Reynolds number can be lowered indefinitely if certain types of perturbations occur. Specifically these involve relatively abrupt changes in amplitude. This provides a possible explanation for the disagreement between earlier theory and experiment.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: T. H. Gawain
Aeronautics
Department

Measurement of Case Wall Pressure Signatures
in a Transonic Compressor using Real-time
Digital Instrumentation

Gordon Curtis Paige
Lieutenant Commander, United States Navy
B.S., Naval Postgraduate School, 1975

Instrumentation, computer programs and experimental techniques were developed to record digitally and in real-time the pressure at the case wall of a transonic axial compressor. Kulite semiconductor strain gauge transducers were used to sense pressures at frequencies up to 5.7 KHz. A Hewlett-Packard microcomputer and analog-to-digital converter sampled the transducer output at 100 KHz and subsequently transferred data to an HP 9830A programmable calculator and mass memory unit for storage and reduction. A periodic flow generator for frequencies up to 10 KHz was designed and built to bench test and verify the techniques for the compressor measurements. Calibration experiments were conducted on all components of the system. Data were obtained in compressor tests at two speeds and at several throttle conditions. The data from one full rotor revolution are presented as pressure distributions across a single blade-to-blade space.

Master of Science in
Aeronautical Engineering
June 1976

Advisor: R. P. Shreeve
Aeronautics
Department

MICROPROGRAMMABLE DATA ACQUISITION
AND PROBE CONTROL SYSTEM (MIDAS IV)
WITH APPLICATION TO COMPRESSOR TESTING

DENNIS DELANE PATTON
LIEUTENANT, UNITED STATES NAVY
B.S., PURDUE UNIVERSITY, 1970

The construction and use of a programmable, fully automatic data acquisition and control system (MIDAS IV) is reported with application to probe surveys in a turbomachine. The MIDAS IV system was designed to record up to 48 channels of analog data, position and align a pneumatic probe in the direction of flow in surveys across a flow passage, and control the operation of up to four Scanivalve pneumatic switches. The MIDAS IV input and output is presently via a teletypewriter keyboard and paper-tape punch. A direct interface with the Hewlett-Packard HP 9830A calculator is a logical modification of the system.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: Raymond P. Shreeve
Department of
Aeronautics

Static Pressure Effects
on
Stern Seal Lift and Drag
of the XR-3 Captured Air Bubble Testcraft

John Scott Payne
Lieutenant, United States Navy
B.S., United States Naval Academy, 1967

Tests were run to determine the static pressure forces present on the surface of the stern seal of the XR-3 surface effects ship testcraft.

These experimentally determined forces were resolved into lift and drag following a determination of stern seal shape at each of the test speeds. The lift and drag determinations cannot yet be meaningfully related to total drag of the craft, but they provide an isolated look at direct effects of plenum chamber overpressures while varying speed. The unique variations of seal position and shape with changes in velocity, noted and documented during this project, may present new difficulties in attempts to analytically model and evaluate seal performance.

Master of Science in
Aeronautical Engineering
December 1975

Advisor: Donald M. Layton
Department of
Aeronautics

Determination of Rotor and Stator
Loss Coefficients for an Axial Turbine
With Supersonic Stator Exit Conditions

Edward Franklin Robbins
Lieutenant, United States Navy
B.A., St. Joseph College, 1968

The results of seven different tests of a single stage axial turbine with converging-diverging stator nozzle are reported. From measurements in a special test rig, losses occurring in the stator and rotor blade rows were separately calculated and the performance of the stage was also determined. The rotor speeds varied from 9,500 to 18,600 r.p.m. and the pressure ratios varied from 1.75 to 3.25. The Mach numbers at the stator exit varied from 0.79 to 1.38. The results for this turbine are appraised and a procedure is demonstrated for smoothing loss coefficient data from the turbine rig. Test rig improvements reported include the design and construction of a new flow nozzle and the revision of the data reduction programs to access a Hewlett-Packard Model 9867B Mass Memory unit.

Master of Science in
Aeronautical Engineering
June 1976

Thesis Advisor: R.P. Shreeve
Aeronautics
Department

A Critical Examination of Two Classical
Assumptions in Fatigue Monitoring of Aircraft

Wayne Franklin Savage
Lieutenant, United States Navy
B.S., United States Naval Academy, 1967

The fatigue design and the current fatigue monitoring system of a modern Naval high performance aircraft is discussed. The design phase, full scale fatigue test and application of the test data to a large fleet of A-7 aircraft is investigated through manufacturer's reports. Current proposed methods for fatigue monitoring are presented and the feasibility of using strain-gages coupled with a micro-computer system is discussed. This system could eliminate the requirement for assumptions that are inherent in the current system and provide data that can be applied to a modified damage accumulation theory, which would account for stress level interactions and associated residual stresses. Recommendations for further studies in the area of fatigue monitoring improvements are presented.

Master of Science in
Aeronautical Engineering
September 1975

Advisor: G. H. Lindsey
Aeronautical Engineering
Department

Microprogrammable Integrated Data Acquisition System-
Fatigue Life Data Application

Wesley Craig Stantfield
Lieutenant, United States Navy
B. S. , United States Naval Academy, 1969

The "Microprogrammable Integrated Data Acquisition System-Fatigue Life Data Application" (Midas FLD) is a microprocessor based data acquisition system. It incorporates a Pro-Log Corporation MPS 803 microprocessor, Microvox wafer recorder and various integrated circuit devices to process analog signals. The program written for the MPS 803 is dedicated to processing and recording in sequence aircraft fatigue data originating from strain gages located at fatigue critical points. This thesis describes the various modules of the system and details the development process used in constructing Midas FLD, including the application of the PLM compiler, Intellec 8 development computer and associated testers. Appendix II gives detailed instructions for reconstructing Midas FLD.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: Gerald H. Lindsey
Department of
Aeronautics

An Ambient Air Quality Model
for
Assessment of U.S. Naval Aviation Emittants

Gary Robert Thompson
Lieutenant, United States Navy
B.S., Old Dominion College, 1968

An air quality assessment model for U.S. Naval aircraft operations was developed from a generalized air quality assessment model for U.S. Air Force operations. Data were gathered by observation of operations at a Naval Air Station and these data used to conduct parametric studies to demonstrate the capabilities of the model. Modifications to the original model and these parametric studies are discussed.

Master of Science in
Aeronautical Engineering
June 1976

Advisor: David W. Netzer
Department of Aeronautics

Laser Doppler Anemometer Measurement and Analytical
Comparison of Flow Around a Cylinder
at Low Reynolds Number

Terry Scott Wanner
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

In this study, the flow characteristics of air around a circular cylinder were determined by two means: by analytical solution of the Navier-Stokes equations, and actual measurement of the flow itself. A DISA LD 5586 laser doppler anemometer system was employed to measure normal (v) and parallel (u) velocity components of a laminar flow regime about a three-sixteenths inch diameter cylinder mounted in a 32 x 45 inch wind tunnel (Reynolds number approximately 40).

A finite element grid was constructed using triangular elements which encompassed the upper half-cylinder. Flow measurements using the velocimeter were confined to this region of interest.

Theory was compared against experimental results, and the feasibility of the utilization of this particular type of laser anemometer was evaluated.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: Daniel J. Collins
Department of
Aeronautics

AN EXPERIMENTAL INVESTIGATION OF THE WHISTLER NOZZLE AND
AN ANALYTICAL INVESTIGATION OF A RING WING IN SUPERSONIC
FLOW

Donald L. Weiss
Second Lieutenant, USMC
B.S.A.E., USNA, 1974

This thesis consists of two parts. First, an experimental investigation of a new device called the whistler nozzle was conducted. Experiments were conducted in the areas of nozzle efficiency, mass entrainment, and flow visualization. Flow visualization showed the presence of a Coanda type jet wall interaction in the nozzle collar. Thrust efficiencies indicated that whistling could be achieved without much greater losses than the basic axisymmetric jet. Entrainment tests were inconclusive regarding the whistler nozzle performance. Second, supersonic flow past an oscillating cylindrical shell is analyzed using linearized characteristics methods. Pressure distributions and generalized aerodynamic forces are calculated and presented for various radius to length ratios and reduced frequencies. Good agreement is obtained in the two dimensional limiting case with previous work by Platzer, and an early solution of the steady cylindrical case by Zierep.

Master of Science in
Aeronautical Engineering
March 1976

Advisor: M. F. Platzer
Department of
Aeronautics

DEVELOPMENT OF MINIATURE DIGITAL TELEMETRY SYSTEM

Guy Weaver Wicks
Lieutenant Commander, United States Navy
B.S.M.E., University of
Southern California 1965

Michael Paul Waite
Lieutenant, United States Navy
B.S.E.E., P.E.E., North Carolina
State University 1969

This paper describes the design improvements and packaging of a miniature multi-channel digital telemetry system for use in remote controlled aircraft experiments coordinated by the Aeronautical Engineering Department at the Naval Postgraduate School. The avionics package, comprised of data encoder, transmitter, power supply, and pod-mounted sensor package, is small and lightweight; has low current requirement; and can transmit up to nine channels of data. The system has been modified to accept either potentiometric or voltage-output transducers. The ground receiving station provides an analog voltage output for each data channel that is linearly dependent on the airborne sensor output. This thesis emphasizes the modifications made to the existing system to provide more versatility, greater dependability and ease of operation.

Master of Science in
Aeronautical Engineering
September 1975

Advisor: Donald M. Layton
Department of
Aeronautics

An Experimental Investigation
of the Efficiency and Entrainment Rates
of a Fluidically Oscillated Jet

Richard James Veltman
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

A study was made of the nozzle efficiency and entrainment rates of jets which were made to oscillate by fluidic means. The entrainment rates were determined using conventional pitot-static tubes which indicated significant increases for the oscillatory jet versus the steady jet. Also, work was started to verify these results using the Ricou-Spalding entrainment chamber.

Master of Science in
Aeronautical Engineering
June 1976

Thesis Advisor: M.F. Platzer
Aeronautics Department

COMPUTER SIMULATION OF A PROPELLANT FEED SYSTEM FOR A
LIQUID PROPELLANT GUN

Craig Richard Dampier
Lieutenant, United States Navy
E.S., United States Naval Academy, 1970

A computer model was developed to simulate a projectile ram-propellant feed system for a Liquid Propellant Gun. Using a lumped parameter approach, a set of simultaneous differential equations was derived for the complex interaction of the propellant fluid, the driving injector and the projectile. The computer model was verified against a 20 mm experimental apparatus. Injector displacement, projectile displacement, and chamber pressure were compared for a nominal driving pressure of 140 psi. The important system parameters affecting projectile ram time and chamber pressure oscillations were investigated and potential problem areas for testing with actual propellant were identified.

Master of Science in
Applied Science
June, 1976

Advisor: T. M. Houlihan
Mechanical Eng.
Department

Study and Design of
Flight Data Recording Systems
for Military Aircraft

Lloyd Norman Baetz
Captain, Canadian Armed Forces
B.E.Sc., University of Western Ontario, 1970

Investigation of aircraft wreckage does not provide crash investigators with adequate information. Crash-protected flight recorder data is invaluable when determining accident cause factors. Inertial navigation systems provide an excellent source of highly accurate flight parameters. Nonvolatile solid state memory is available which can replace failure prone magnetic tape recording in flight recorder systems. Microprocessors are available with the capability of compressing flight data for solid state memory storage. Data compression trials indicate that a flight data recording system using microcomputer preprocessing and nonvolatile solid state memory is feasible.

Master of Science in
Computer Science
June 1976

Advisor: U. R. Kodres
Computer Science
Department

On the Use of Color in Raster-Scan Graphics

Michael E. Bisgrove
Lieutenant, United States Navy
B.A., University of California at Los Angeles, 1969

A review of the literature which pertains to the effects of color on human visual performance does not clearly substantiate that color is always a desirable feature of a computer graphics display. A specific format for displaying safety information from an underwater instrumented range is designed and the incorporation of color to best advantage is investigated. A seven color coding scheme is proposed and defended; examples uses of color are shown.

Master of Science in
Computer Science
June, 1976

Advisor: V. M. Powers
Computer Science
Department

DESIGN CONSIDERATIONS FOR IMPLEMENTING A SHIPBOARD
COMPUTER SUPPORTED COMMAND MANAGEMENT SYSTEM

Patrick Anthony Callahan
Lieutenant Commander, United States Navy
E.S., United States Naval Academy, 1966

This report outlines an approach for the implementation of a shipboard computer supported management information system. The physical design specifications and design philosophy are investigated. The application of mini-computer technology applied to the shipboard environment is presented. Specific administrative functions are recommended for automation.

Master of Science in
Computer Science
June 1976

Advisor: E. A. Gold
Computer Science
Department

MEASUREMENT AND EVALUATION OF COMMERCIAL TIME-SHARING
VENDORS

Kelly S. Callison
Lieutenant, United States Coast Guard
E. S., United States Coast Guard Academy, 1971

This is a description of a logical approach to the problem of selecting a commercial time-sharing system for a specific application. Supporting information was gathered from current technical literature and from discussions with both vendors and users. The final result is a blend of the principles of economic analysis and the realities of data processing.

Master of Science in
Computer Science
June 1976

Advisor: N. F. Schneidewind
Computer Science
Department

AD-A038 604 NAVAL POSTGRADUATE SCHOOL MONTEREY CALIF

ABSTRACTS OF DISSERTATIONS, THESES AND RESEARCH PAPERS SUBMITTED--ETC(U)

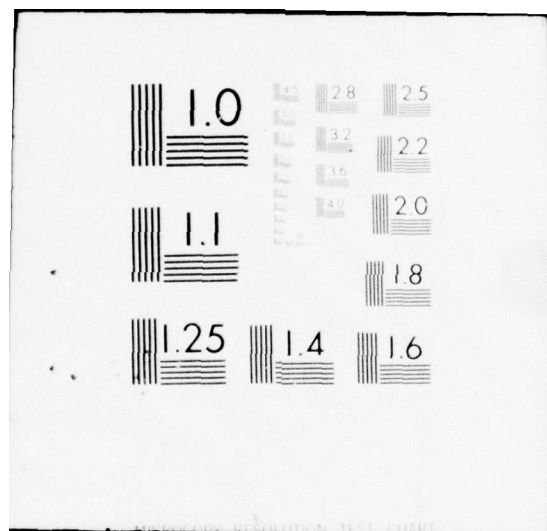
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An Interactive Simulation
of the IBM System 360
Operator's Console

John Joseph Crowley, Jr.
Lieutenant, United States Navy
B.A., College of the Holy Cross, 1968

Larry Neil Karns
Lieutenant, Supply Corps, United States Navy
B.S., Austin Peay State University, 1968

The manager of a computer facility must be cognizant of all aspects of computer systems; be knowledgeable of both hardware and software requirements and developments; and be aware of factors which effect the throughput of the system. One such factor is the area of operator/machine interaction.

This research simulates the operator console of the IBM System/360 implemented at the U. S. Naval Postgraduate School. The simulation is designed to run interactively under CP-67/CMS and is intended to be utilized in a graduate course for Computer Systems Management students. A provision has been made which allows for the running of various job streams in order to measure the operator's ability to react to different situations.

Master of Science in
Computer Science
June 1976

Advisor: CDR C. P. Gibfried
OR/AS Department

Microcomputer Based Pitch and Depth
Controller for a Submarine
Using Optimal Control Theory

Heinz-Dieter Dockhorn
Lieutenant Commander, Federal German Navy

Microcomputer systems will influence future technical changes in a submarine. As a demonstration of the computational power of the microcomputer, an optimal controller for the pitch and depth of a submarine was developed using the INTEL 8080 microcomputer. A model simulating a submarine and the control algorithm were first written in a simulation language DSL/360. The control algorithm was then coded in the microcomputer language PLM and implemented on a microcomputer. Also included is an investigation of the feasibility to execute the PLM program in a given time frame, an analysis of the computational errors and the inherent errors in measurements from peripheral devices.

Master of Science in
Computer Science
June 1976

Thesis Advisor: U.R. Kodres
Computer Science Department

The Development of a
Partitioned Segmented Memory Manager
for the
UNIX Operating System

Harvey William Emery, Jr.
Captain, United States Marine Corps
B.S., Massachusetts Institute of Technology, 1968

This thesis reports the results of an investigation of the applicability of paging and segmentation to memory management in modified UNIX operating systems on the PDP-11/50 minicomputer system at the Naval Postgraduate School Signal Processing and Display Laboratory. Two memory managers are specifically considered: a partitioned segmented memory manager that was designed and implemented; and a simpler, segmented memory manager that was designed based on the performance of the partitioned segmented memory manager. Recommendations are given for future work.

Master of Science in
Computer Science
June, 1976

Advisor: G. L. Barksdale, Jr.
Assistant Professor of
Computer Science

Evaluation of
the Direct View Storage Display
for Signal Analysis

William Alvin Fuson
Lieutenant, United States Navy
B.A., Miami University, 1969

The visual processing of received radio and acoustic frequency spectrum data by human analysts forms an important portion of our current defense efforts. Both of these areas present many of the same basic problems to the analyst. These problems center on discovering the most effective means of presenting the data to a human observer for investigation. Currently the prevalent analysis medium for acoustic data is the lofarogram, figure 1.

The basis of this thesis is a system developed at the Naval Postgraduate School, which has been labeled SPOTLIGHT (Signal Processing of Time Lines by Graphics Techniques), that gives an alternative to the lofarogram approach. SPOTLIGHT as originally implemented utilized a rather extensive hardware layout both in terms of physical size and expense. The work described herein comprises the beginning of an effort to analyze the capabilities of more modern, less expensive and smaller equipment in the SPOTLIGHT type of environment.

Master of Science in
Computer Science
March, 1976

Advisor: George A. Rahe
Computer Science
Group

An Implementation of a CODASYL Based
Data Base Management System
under the
UNIX Operating System

John Edward Howard
Captain, United States Marine Corps
B. A., University of Texas at Austin, 1969

This thesis reports the implementation of a Data base Management System (DBMS) based on the CODASYL design. The DBMS was implemented on a DEC PDP 11/50 computer utilizing the UNIX operating system. Background material includes a discussion of data base history and techniques, design of UNIX and the C programming language. The research performed was the adaptation of the CODASYL DBMS design to the UNIX environment and the design of a C language Data Description Language (DDL) and Data Manipulation Language (DML) to interface the DBMS to user programs. Conclusions and recommendations for improvements are also included.

Master of Science in
Computer Science
June, 1976

Advisor: G. L. Barksdale, Jr.
Assistant Professor of
Computer Science

Implementation of
An Adaptive Scheduling Algorithm
for the
MUNIX operating System

Ronald Edward Joy
Captain, United States Air Force
U.S., United States Air Force Academy, 1971

The design, implementation, and evaluation of an adaptive scheduling algorithm for the MUNIX operating system is reported here. MUNIX, a multiprocessing version of UNIX, was designed to run on a dual PDP 11/45 multiprocessor system. Topics covered include: a survey of adaptive scheduling, laboratory equipment configuration, scheduling with MUNIX, benchmark testing, and non-adaptive scheduling changes. Conclusions and suggestions for possible improvements are also included.

Master of Science in
Computer Science
December 1975

Advisor: Gerald L. Harksdale, Jr.
Computer Science
Group

ANALYSIS OF PROGRAM STRUCTURE AND ERROR CHARACTERISTICS AS
APPLIED TO NTDS PROGRAMS

Michael Kirchgaessner
Lieutenant-Commander
Federal German Navy

A simulation model for the evaluation of program structure and error detection has been applied to the analysis of selected parts of NTDS programs. The simulation results were used to establish the relationship between program structure and measures of program complexity. This information would be used for the design and testing of software.

Master of Science in
Computer Science
June 1976

Advisor: N.F. Schneidewind
Computer Science
Department

TACTICAL ELECTRONIC RECONNAISSANCE
PROCESSING AND EVALUATION SEGMENT:
A NEW LOOK

Daniel Patrick Kellay
Captain, United States Marine Corps
E.S., United States Naval Academy, 1969

Kenneth Lee Kreutzer
Lieutenant, United States Navy
E.S., Miami University of Ohio, 1971

With the proposed procurement of EA-6E aircraft, the U.S. Marine Corps planned the development of TERPES (Tactical Electronic Reconnaissance Processing and Evaluation Segment) to perform post-mission tape analysis. The development phase was initiated on a first generation tactical computer, CP-642B. The thrust of this paper was to identify state-of-the-art replacements for the CP-642B, while identifying areas of concern within the development cycle. Alternative systems were discussed with the emphasis on system flexibility and expandability.

Master of Science in
Computer Science
June 1976

Advisor: N.F. Schneidewind
Computer Science
Department

Distributed Microcomputer Airborne Tactical System

Tuxaua Plinio Barcelos de Linhares
Lieutenant Commander Brazilian Navy
B.S., I.M.E., Rio de Janeiro-Brazil, 1969

An airborne tactical system composed of three distributed microcomputers is described. An extrapolation technique using the method of orthogonal polynomials is presented to solve the ballistics problem.

In order to test the performance of distributed microcomputers for real time military applications, a simplified airborne tactical system, utilizing two microcomputers working in parallel, is implemented.

The motivation for this research is the reduction of cost that would result from the use of microcomputers in such systems.

Master of Science in
Computer Science
December 1975

Advisor: Uno R. Kodres
Computer Science
Group

Interface of the CSP-30 System
with the
UNIX Operating System

Albert Leonard May
Lieutenant, United States Navy
P.S., Auburn University, 1969

This paper discusses the design of the protocols and interfacing of a CSP-30 computer system with the UNIX operating system as presently installed on a dual PDP 11/50 processor system. Additionally, a cross assembler for the CSP-30 system was designed and installed on the PDP 11/50 system in order to utilize the superior text processing capabilities of the UNIX operating system's text editor to program the CSP-30 processor.

Master of Science in
Computer Science
June, 1976

Advisor: G. L. Parksdale, Jr.
Computer Science
Department

Graphics Subsystem for a Terminal
with
Conic Section Capabilities

States Lee Nelson
Lieutenant, United States Navy
BSMA, Illinois Institute of Technology, 1971

The aim of this thesis is to design and implement a graphic subsystem for a graphic display terminal with conic section capabilities. The display terminal with its associated peripheral hardware is connected to a PDP-11/50 computer.

The basic concepts and design principles of graphic systems are discussed. A brief description is given of the particular hardware configuration of the Conographic-12 display system as installed at the Naval Postgraduate School. Concepts incorporated in the designed implementation are explained. Recommendations are included for possible future extensions of the system's capabilities.

Master of Science in
Computer Science
June 1976

Advisor: Gary M. Raetz
Computer Science
Department

The Design of a User Interface
for a
Color, Raster Scan Graphics Device

Roder Lee Nesslade
First Lieutenant, United States Marine Corps
B.A., Culver-Stockton College, 1971

This thesis is a summary of the design and implementation of a user interface for a color, raster-scan graphics display device. The problems, solutions and a general set of guidelines related to designing an interface for a color capable graphics device are discussed. The implementation of a software interface for a RAMTEK GX-100A with the PDP-11/50 computer is presented. The interface is implemented within the conventions of the C programming language and executes under the UNIX operating system. Recommendations for further expansion of the interface are discussed.

Master of Science in
Computer Science
June, 1976

Advisor: Gary M. Raetz
Lieutenant Junior Grade
United States Navy

ML80: A Structured Machine-Oriented
Microcomputer Programming Language

Luiz Roberto Borges Pedrosa
Lieutenant Commander, Brazilian Navy
B.S., Pontificia Universidade Catolica do Rio de Janeiro, 1974

A structured systems programming language for the 8080 microprocessor is described. The language provides an algebraic notation for machine-level register and data operations, while incorporating most control constructs available in block-structured high-level languages. Compile-time facilities include recursive macros, expression evaluation, and conditional compilation. Object programs are relocatable, and independently compiled procedures can be linked at load-time. The resident compiler executes on a microcomputer system with 16K bytes of main memory.

Master of Science in
Computer Science
December 1975

Advisor: Gary A. Kildall
Computer Science
Group

A Computer-Assisted
Petty Officer Assignment System
for the Turkish Navy

Celal Seyhan
Lieutenant (Junior Grade) Turkish Navy
Turkish Naval Academy, 1970

A computer-assisted petty officer assignment model for the Turkish Navy has been formulated and developed. The objective of the model is to assist the personnel officer in making decisions during the petty officer assignment process.

The history and the personnel organization of the Turkish Navy are described for background purposes. Data bases for personnel characteristics and billet requirements have been created. Weighting factors which affect the assignment decision have been described. In addition, the processing of the model has been described in a detailed manner and flowcharts of the model have been included. Management Information System (MIS) implementation plans and a network diagram have been presented and explained.

Master of Science in
Computer Science
June 1976

Advisor: C. P. Gibfried
OR/AS Department

Implementation of an
Interactive Graphics Display
in a
Multiprogramming Environment

Lloyd Allen Thorpe
Lieutenant, United States Navy
B.S., University of Utah, 1971

This thesis is a summary of the design and implementation of an operating system interface and a user interface for an interactive graphics display system. The actual interface software and documentation are characteristic of the Naval Postgraduate School environment. Documents describing the actual software and user interface are published separately.

The general problems and solutions involved in implementing a real-time interactive graphics process in a multiprogramming environment are included herein. The problems and solutions discussed are related to the interface of a Vector General Graphics Display Unit and a Digital Equipment Corporation PDP-11/50 computer. Recommendations for possible future developments are also included.

Master of Science in
Computer Science
March, 1976

Advisor: Gary M. Kaetz
Lieutenant Junior Grade
United States Navy

Microstrip Loss

Remzi Arikonmaz
Lieutenant, Turkish Navy
B.S.E.E., Naval Postgraduate School, 1975

This thesis presents a frequency dependent analysis of microstrip loss. Spectral domain theory is employed to develop expressions for both dielectric and conductor loss in a form suitable for programming on a digital computer. Computational results are presented and compared with those of other investigators.

Master of Science in
Electrical Engineering
December 1975

Advisor: Jeffrey B. Knorr
Department of Electrical
Engineering

A LEVEL DENSITY ANALYZER FOR SHIPBOARD RFI MEASUREMENTS

Dennis Calvin Arneson
Lieutenant
B. S., University of Idaho

The design and construction of a LEVEL DENSITY ANALYZER for use in the measurement of shipboard RADIO FREQUENCY INTERFERENCE consisted of integrating various analog and digital integrated circuits and related electronic components to enable accurate level analysis of a broad range of analog signals including noise and/or electromagnetic waves which constitute radio frequency interference. The overall design and system goals were to be able to adequately sample an analog signal, classify it, convert the classification to digital data and provide outputs to be logged either by manual or magnetic tape means. The design and construction efforts efficiently and economically achieved these goals.

Master of Science in
Electrical Engineering
June, 1976

Advisor: John E. Ohlson
Electrical Engineering
Department

Survey on Modern Radar Signal Processing

Joao Paulo Goncalves Barcia
First Lieutenant, Portuguese Navy
B.S. Naval Postgraduate School, 1974

The purpose of this thesis is to investigate the state of the art of radar signal design as well as radar signal processors and determine the actual trends in modern radar design. The use of a digital general purpose radar signal processor is discussed. The concepts of ambiguity and autocorrelation function are investigated in regard to radar resolution capabilities. The concept and analytical development of the DFT/FFT are presented. Quantization noise in a digital MTI processor and its effects in the improvement factor are analyzed. Optimization techniques for the response curve of digital MTI processors using staggered PRF are investigated. The SAR concept and analysis as well as techniques to obtain low correlator rates in the SAR digital processors are presented.

Master of Science in
Electrical Engineering
December 1975

Advisor: John Bouldry
Electrical Engineering
Department

Processing of the Manual Morse Signal
Using Optimal Linear Filtering,
Smoothing and Decoding

Edison Lee Bell
Lieutenant, United States Navy
B.E.E., Georgia Institute of Technology, 1969
M.S.E.E., Naval Postgraduate School, 1974

This thesis investigates the problem of automatic transcription of the morse signal, and describes and documents several approaches to filtering, processing, and decoding it for transcription. The baseband signal is first modeled as a modified random telegraph wave. A discrete Kalman filter and a linear smoother are then used to process the demodulated signal in order to gain a measure of the effectiveness and applicability of this model. It is shown experimentally that this model and processing yield a significant reduction in the transcription error rate. Next, a Viterbi decoder algorithm based on a simple Markov model of the code is programmed and tested. Finally, the baseband signal model is incorporated in a more general model for pre-detection Kalman filtering. It is shown that this filter permits acceptable recovery of morse signals whose average signal-to-noise ratio is as low as -14 dB in a 2 kHz bandwidth.

Electrical Engineer
September 1975

Thesis Advisor: S. Jauregui
Electrical Engineering
Department

Charge-Coupled Devices
for Analog Signal Processing --
A Circuit Study

Maxwell Douglas Biddle, Jr.
Lieutenant Commander, United States Navy
B. Ch. E., University of Louisville, 1959

The operation of a two-phase charge-coupled shift register is discussed and analyzed. A parametric study for simultaneous operation with more than one input signal is presented. The output circuit is analyzed for its contribution to non-linearity. An analog signal processing linear model of the charge-coupled device is proposed.

Master of Science in
Electrical Engineering
March 1976

Advisor: Tien F. Tao
Electrical Engineering
Department

Detection of Signals in Noise
Using Single Channel Receivers

John Lowell Bilodeau
Captain, United States Marine Corps
B.S., Auburn University, 1967

A single-channel receiving system capable of detecting low power signals and of determining their angle of arrival is presented. The technique is based on the correlation of a signal with its reflection. The effect of noise is considered, and the feasibility of detecting a signal for which the autocorrelation is known is given. The description of a practical system which was constructed is provided, and the results of operation of this receiving system in the UHF band are presented.

Master of Science in
Electrical Engineering
December 1975

Thesis Advisor: G.A. Myers
Electrical Engineering
Department

Experimentation and Design
for a
Computer to Computer Fiber Optic Data Link

Roland Daly Blockson, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

This project is a survey of current state-of-the-art techniques and describes the design and demonstration of a low speed fiber optics link between a microcomputer and remote peripheral device (ASR-33 teletype). In addition, preliminary design is included for a high speed multiplexed fiber optic link.

Master of Science in
Electrical Engineering
December, 1975

Advisor: G. L. Sackman
Electrical
Engineering
Department

A Study of Pressure-Volume Rates and Plenum
Membrane Additions to the Captured Air
Bubble Surface Effect Ship XR-3 Digital
Computer Loads and Motion Program

John Martin Boggio
Lieutenant, United States Navy
B.S. E.E., Purdue University, 1967

A study was conducted of modeling changes to the XR-3 Captured Air Bubble Surface Effect Ship digital computer Loads and Motion program. These changes included the addition of pressure rate and volume rate to the existing 6 degrees of freedom equations. Additional equations were developed to simulate the application of a nonpermeable membrane to the plenum of the XR-3 test craft. The objectives of this study were to determine whether the addition of pressure rate and volume rate equations would improve computer execution time and to test some simplified models of the plenum membrane. Computer timing improvements were demonstrated and membrane modeling results are presented.

Master of Science in
Electrical Engineering
June 1976

Advisor: A. Gerba, Jr.
Department of Electrical
Engineering

The Frequency Response
and
Operating Characteristics
of the
XR-3 Loads and Motions Program

Bryant Fred Booth III
Lieutenant, United States Navy
B.S.E.E., Iowa State University, 1970

The XR-3 Loads and Motions Program, a digital computer simulation of the six degrees-of-freedom equations of motion for the XR-3 captive air bubble test craft, is subjected to a wide range of regular and irregular wave excitations. The operating characteristics of the simulated craft and the frequency response functions for the heave, pitch, and roll responses in ahead, abeam, and following seas are obtained for regular wave excitations. The ahead seas frequency response functions are verified with irregular wave excitation.

Master of Science in
Electrical Engineering
June 1976

Advisor: Alex Gerba, Jr.
Department of Electrical Engineering

Improved Radar Range-Gated MTI Processor

Charles James Boyle
Captain, United States Marine Corps
B.S., Pennsylvania State University, 1969

A redesigned timing circuit and improved bandpass filters were constructed and integrated with the MTI range-gate-and-filter modification kit for the Naval Postgraduate School AN/UPS-1D radar. Principle improvements allow operation in a jittered PRF mode and increased effectiveness of channel filters through the use of active fifth-order Butterworth analog filters. The design objectives were to achieve the elimination of blind speeds, improved frequency response of the channel filters and the reduction of the MTI minimum discernable signal.

Master of Science in
Electrical Engineering
December 1975

Advisor: David B. Hoisington
Department of
Electrical Engineering

An Alternative to Nonlinear Estimation
in
Gun Fire Control Systems

Robert Keith Brands
Lieutenant, United States Navy
B.S., Moorhead State College, 1969

A Kalman filter with assumed linear system dynamics was derived from a spherical coordinate state vector and applied to a fire control system tracking environment. Two models of target dynamics were developed: a constant-velocity model and a correlated random acceleration model. The predicted position performance of the filters derived from the two basic models was optimized using Monte Carlo methods against a set of test trajectories that include constant-velocity and maneuvering target profiles. The results of the Monte Carlo simulation of these filters are compared with the results obtained from a filter derived from a Cartesian Coordinate state vector. Switch-on-range adaptive filters were developed from the two basic models and evaluated by Monte Carlo methods. The results of the simulations of the adaptive filters with the two different state vectors are compared.

Master of Science in
Electrical Engineering
December 1975

Advisor: Donald E. Kirk
Electrical Engineering
Department

The Design and Fabrication of a
Portable Radar Direction Finder

Wilson Lee Carmean
Lieutenant, United States Navy
B.S., Purdue University, 1969

This thesis discusses the design and fabrication of a radar warning and direction finding device for use in small boats. It is small in size, lightweight, inexpensive, and can operate on standard flashlight batteries.

Crystal-video receivers provide adequate sensitivity for this device. The radar pulse envelope is detected directly from the signal received on a wideband antenna, amplified, and then the signal is sent to a visual display and an audio amplifier. The operator's ear is used as a pulse-repetition-frequency discriminator, necessary when two or more radars are present simultaneously. Test results indicate the maximum range of the device is approximately the same as the radar horizon. Bearing accuracy is within plus or minus ten degrees.

Master of Science in
Electrical Engineering
June 1976

Advisor: D. B. Hoisington
Electrical Engineering
Department

Computer Modeling
of Basic Neural Circuits

James Mann Carney
Lieutenant, United States Navy
B. S., United States Naval Academy, 1970

A computer modeling of basic neural circuits is presented using a digital computer.

A brief anatomy of the central nervous system and neural conduction is presented. The postsynaptic membrane potential (PSP) is defined and discussed. The effects of random inputs on the PSP is discussed along with the interrelationships between exponential rise and fall time constants, refractory period, and threshold potential. A stochastic measure for determining the likelihood of an output given an input is presented.

A model for generating oscillatory PSP's, the alpha wave in particular, is presented. The effect of additional inputs on an otherwise sinusoidal PSP is discussed.

Master of Science in
Electrical Engineering
June 1976

Advisor: George Marmont
Electrical Engineering
Department

Computer Prediction of Tropospheric Radio Transmission
Loss for Selected Paths in the Pacific Northwest

Richard Michael Cassidy, Jr.
Lieutenant, United States Navy
A.B., University of North Carolina, 1970

In order to characterize the propagation conditions along known paths at VHF and S Band frequencies, transmission loss predictions are produced by computer methods. An attempt is made to define the standard atmospheric conditions along these paths through the presentation of the statistics for normal and super-refractive propagation conditions.

Master of Science in
Electrical Engineering
June 1976

Advisor: Jeffrey B. Knorr
Electrical Engineering
Department

Application of the Computer for Real Time
Encoding and Decoding of Cyclic Block Codes

Nizamettin Cetinyilmaz
Lieutenant, Turkish Navy
B.S., Naval Postgraduate School, 1974

This thesis is concerned with cyclic block codes which can be used for the detection and correction of errors in a transmitted message which are produced by various types of noise. Computer programs were developed and used for the actual encoding and decoding process. Advantages of using the computer as against using various types of dedicated hardware is demonstrated. Two different methods of decoding are presented: the minimum distance decoder and the syndrome method decoder. Pseudo random noise sequences were also generated by computer program and used to simulate noise disturbance of the encoded transmitted message. Codes of several rates and with varying degrees of simulated channel noise were studied and compared with respect to the probability of error. It is shown how the methods developed in this thesis can materially help in choosing the 'best' code for a given noisy channel, consonant with other specified parameters for message transmission.

Master of Science in
Electrical Engineering
December 1975

Advisor: George Marmont
Department of Electrical
Engineering

The Application of Extended
Kalman Filtering to the
Position Locating Reporting System (PLRS)

Charles A. Dittmar, Jr.
Captain, United States Marine Corps
B.S., United States Naval Academy, 1968

Extended Kalman filtering is applied to the PLRS (Position Locating Reporting System). Here the nonlinearity to the filter enters through the measurement (range only). The nonlinearity being the relationship between range and the cartesian coordinate states of the filter.

Filter covariances of error are portrayed as error ellipsoids. These are used in the determination of whom one should use in updating a unit when there are several other units available for ranging. One should attempt to make the range measurement in the same direction of the major axis of error associated with the unit to be updated.

The filtering techniques are evaluated using static units and high speed maneuvering aircraft.

Master of Science in
Electrical Engineering
December 1975

Thesis Advisor: H.A. Titus
Electrical Engineering
Department

Automatic Control of Submarine
Depth, Pitch and Trim

Harold Leroy Drurey
Lieutenant, United States Navy
B.S., Naval Postgraduate School, 1974

A computer program for simulating submarine motion in six degrees of freedom is developed. The simulated submarine is given a capability of shifting ballast. An automatic pitch and depth control is designed for the submarine simulated using optimal control theory. With the depth and pitch in automatic control a trim error signal is developed by comparing the parameters of the plant to that of a linearized model. This error is used to implement an automatic trim control that shifts ballast within the submarine to achieve a neutral trim.

Master of Science in
Electrical Engineering
September 1975

Advisor: George J. Thaler
Electrical
Engineering
Department

An Analysis of Motor Function and Control
in the
Human Nervous System

Robert Edward Dzialo
Captain, United States Marine Corps
B.S.A.E., Auburn University, 1966

A theory is presented on voluntary learned and unlearned motor movement. The basic elements on motor control are presented, analyzed, and discussed. These include fundamental reflexes, gamma-muscle spindle servo mechanism, reticular system, cerebellum, and higher brain centers. The interrelations between the above elements and systems are examined in detail as a basis of the theory presented. The theory follows the transition from unlearned to learned movement and demonstrates how detailed control may be modified by the cerebellum and associated areas.

Master of Science in
Electrical Engineering
December 1975

Advisor: George Marmont
Department of Electrical
Engineering

Preferred Frequencies in the
Human Electroencephalogram

Douglas David Frisbie
Captain, United States Marine Corps
B.S.E.E., Marquette University, 1967

Past efforts in spectral analysis of the electroencephalogram at the Naval Postgraduate School are reviewed. Preferred frequencies are defined as those frequencies which exhibit increased magnitude or duration when a subject is engaged in specific activities. Findings related to the behavior of particular frequencies at various scalp positions are discussed. Primary emphasis is on the motor cortex and the junction of the temporal, parietal and occipital regions. Data is presented indicating that frequency ranges 4-8 Hz and 60-120 Hz show increased correlation between closely spaced electrodes when subjects are presented with tasks. Other possible preferred frequencies related to activities such as limb movement, multiplication and reaction to light are presented. A pilot simulation, the Heads Up Display, was found to be an excellent subject tasking mechanism.

Master of Science in
Electrical Engineering
December 1975

Advisor:

George Marmont
Electrical
Engineering
Department

A Study of Adaptive
Delta Modulator Design

Dale Ellard Gabrielson
Lieutenant Commander, United States Navy
B.E.E., University of Minnesota, 1965

Renewed interest in delta modulation has resulted in a proliferation of articles in the literature on the subject. Although most hardware realizations of delta modulation systems have been achieved with analog circuitry, a great portion of the literature deals with the theoretical discussion and results of computer simulations of delta modulation systems using digital circuitry. The purpose of this thesis is two-fold: to provide a compendium of current theory and design techniques of delta modulation systems, and to suggest a possible method of implementing one type of digital adaptive delta modulator utilizing integrated circuits.

Master of Science in
Electrical Engineering
March 1976

Advisor: R. Panholzer
Electrical Engineering
Department

Design Considerations for
Naval Communication Systems

Orlando Grisales Jimenez
Lieutenant, Colombian Navy
B.S., Naval Postgraduate School, 1975

Without any doubt it is a giant step from the spark-gap transmitter of a half century ago to the transistorized multiplex of today which can simultaneously transmit several hundred words a minute on each of several channels. A few insights of this development of communications are written in the first part of this work.

In the second part the principal topics in the field of communications, such as antennas, electromagnetic-wave propagation, multiplex, modulation, demodulation, and coding are written with the goal of making it as easy as possible for a person to teach himself.

Master of Science in
Electrical Engineering
September 1975

Thesis Advisor: P.E. Cooper
Electrical Engineering
Department

Quasi-Real Time Translation
of Morse-Coded Signals
Using Digital Delay Processing

William Alexander Hickey, III
Lieutenant, United States Navy
B. Chem., University of Tulsa, 1969

This thesis investigates the problems in automatic translation of Morse-coded signals. Specific modifications to a commercially available decoder are made and evaluated. The delay algorithm presented is based upon the attributes of a human operator and is implemented using integrated circuit static shift registers.

Master of Science in
Electrical Engineering
June, 1976

Advisor: S. Jauregui, Jr.
Electrical Engineering
Department

Evaluation of a
Satellite Communications Antenna
for RFI Measurements

Bernhard Klaus Hollar
Lieutenant, United States Naval Reserve
B.S., Virginia Commonwealth University, 1969

This thesis presents data as obtained through experimental means on two types of circularly polarized antenna with respect to their gain and directivity.

The AS-3018/WSC-1(V) shipboard satellite communications antenna is part of antenna group OE-82B/WSC-1(V) and is a broadbeam, moderate gain antenna with four crossed dipole elements mounted in front of a reflecting screen. This antenna is presently being implemented for UHF SATCOM. The EMCO Model 3101 conical log-spiral antenna is a light-weight, broadbeam antenna designed specifically for EMI measurements and specification compliance testing.

Purpose of the tests is to evaluate possible use of both antennas for shipboard RFI measurements, and to find the sensitivity to out of band radiation of the SATCOM antenna.

Master of Science in
Electrical Engineering
December 1975

Advisor: R. W. Adler
Department of Electrical
Engineering

Monte-Carlo Evaluation of Digital Filters
for Fire Control Systems

Toshiaki Iida
Lieutenant (junior grade)
Japanese Maritime Self Defense Force

Adaptive techniques are investigated for tracking maneuvering targets from noisy measurements of position coordinates. Two types of adaptive estimators are considered, a Q-generated estimator and a Residual-testing estimator. Monte-Carlo simulation is used to compare the performance of these adaptive estimators to that obtained by using several constant-Q filters.

Master of Science in
Electrical Engineering
December 1975

Advisor: D. E. Kirk
Electrical Engineering
Department

Shipboard Application of a Ring Structured Distributed Computing System

Jeffrey Quentin Jackson
Lieutenant-Commander, Canadian Forces
Bachelor of Science (Engineering Physics)

Considerable research is currently going on into the application of distributed computing systems. They appear particularly suitable for the computing needs of a small warship. The particular constraints of the warship's environment are discussed. This is followed by a description of how a ring structured distributed computing system might be adapted to function in this environment. Included in this consideration are the feasibility of attaining adequate bus speed, the use of multiply addressed messages, and methods of handling real-time processing. Of particular interest is the ability to achieve controlled degradation of performance under failure, especially failure due to battle damage.

Master of Science in
Electrical Engineering
June, 1976

Advisor: Gary M. Raetz
Computer Science
Department

A Spread Spectrum Communications Systems

Utilizing an Umbrella Code

James Alfred Jaques, III
Lieutenant, United States Navy
B.S., Engineers, North Carolina State University, 1968

A pulse stuffing technique is used to eliminate the silent gaps in the transmission of a particular Spread Spectrum system. Unauthorized listeners now have more difficulty in recovering the message content.

A two code device was built using both a pseudorandom maximal length code and a Golay complementary sequence code. The pseudorandom code was used for pulse stuffing an umbrella code and was discarded after a digital matched filter in the receiver. The Golay code was added with a Surface Acoustic Wave dispersive element and removed with a similar device used as a matched filter.

Master of Science in
Electrical Engineering
December 1975

Advisor: S. Jauregui Jr.
Department of Electrical
Engineering

Investigation of Various Navigation Systems that
Would Be Compatible to the TASES Aircraft

Charles Leroy Jeffries
Lieutenant, United States Navy
B.S.E.E., North Carolina State University, 1969

TASES (Tactical Airborne Signal Exploitation System) will modify the basic S-3A avionics system to perform an open ocean fleet support electronic mission. Navigation of the aircraft will be performed by the pilot using systems that were designed for an ASW mission and dual piloted aircraft.

The addition of an automatic Omega tracking receiver would ease the burden of navigation in the event of primary system failure. The pilot/navigator would be provided a reliable and accurate world-wide fixing device that would augment the basic navigation system. A relative fixing scheme could be incorporated, using the Omega system that would provide accurate ranges and bearings of reported targets at distances exceeding 250 nautical miles.

Master of Science in
Electrical Engineering
September 1975

Advisor: S. Jauregui
Electrical
Engineering Department

A Study of a Dielectric Backed Resonant Slot Antenna

Uwe Siegfried Kahre
Kapitanleutnant, Federal German Navy

This thesis describes a study of a dielectric backed resonant slot antenna. E-field and radiation resistance were calculated and compared with measurements. Special effort was devoted to impedance matching between the transition from the coaxial cable to the slot. The effect of this matching on radiation patterns was discussed and the bandwidth of the antenna measured.

Master of Science in
Electrical Engineering
December 1975

Advisor: J. B. Knorr
Electrical Engineering
Department

IF Filter Optimization
for CW-FM Radar

Ergin Kislali
Lieutenant, Turkish Navy
B.S.E.E., Naval Postgraduate School, 1974

A continuous-wave frequency-modulated radar receiver and the IF filter are described.

IF filter responses are investigated from the output of the narrow bandpass filter for various target ranges. The effects of the IF signal pulse width and the duty cycle on the IF filter output including the change of the sidelobe levels out of the filter are examined.

Optimum parameters are obtained from the experimental study and from an analytical solution.

Master of Science in
Electrical Engineering
December 1975

Advisor: D. B. Hoisington
Electrical Engineering
Department

A High Level Noise Blanker
and
RF Amplifier System for the UHF Band

Frederick Earl Mace, Jr.
Lieutenant, United States Navy
B.S.E.E., University of Colorado, 1971

The design and construction of a high level noise blanker and RF amplifier system as used in RFI measurement work is presented. This RFI work is part of the "Shipboard RFI in UHF Satcom" project sponsored by Naval Electronic Systems Command. The system requirements are discussed providing a basis for deriving the system specifications. The design of the solid state blanker is presented in detail along with tests performed on the completed system. Electromagnetic compatibility of the unit with the working environment is considered in the design and in the special construction techniques employed.

Master of Science in
Electrical Engineering
June 1976

Advisor: John E. Ohlson
Department of Electrical
Engineering

A Versatile System for Interfacing
Subject to Task
in EEG Analysis with Biofeedback

Dennis Cruce Marvel
Lieutenant, United States Navy
B.S.E.E., University of Mississippi, 1967

The historical development of the EEG and biofeedback are presented. The requirements for a meaningful biofeedback and tasking system are set forth. A simulated pilot control system which meets these requirements was built, tested and applied. The system is described in detail. Possible future uses and improvements are discussed.

Master of Science in
Electrical Engineering
December 1975

Advisor: George Marmont
Electrical Engineering
Department

A Comparison of AM
and Various SSB Modes
on 2182 kHz

Kenneth Richard Mass
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1971

The Federal Communications Commission is requiring a conversion to single sideband on the 2 MHz band. However, on 2182 kHz, because of international agreement; only the A3H mode is authorized after 1 January, 1977. Many users of this mode have reported a drastic reduction in range of transmission, using authorized power levels. This thesis is a comparison of power requirements for AM and single sideband, and a discussion of the A3H problem.

Master of Science in
Electrical Engineering
September 1975

Thesis Advisor: C.F. Klammer
Electrical
Engineering
Department

Preferred Frequencies of the Human
Electroencephalogram
in Response to Auditory Stimuli

Dennis Cap McCormick
Lieutenant, United States Navy
B.S.E.E., University of Idaho, 1969

The cortical responses of human subjects to auditory stimuli were investigated. The auditory signals consisted of either white noise or individual sinusoidal tones. The electroencephalogram (EEG) signals were analyzed with tegulometric analysis, which is sensitive to the amount of time a given frequency response component is present in the brain's electrical activity.

Normal human EEG's have been found in this research to exhibit a characteristic waveform covering the frequency band between 20 to 60 Hz. Evidence of additional consistent activity under all conditions was observed near 70 Hz, 80 Hz, and 90 Hz.

White noise as an auditory stimulus produced an EEG with less extreme minimum and maximum deviations than an EEG of a relaxed subject with no auditory, visual, or other special stimuli. Therefore, white noise might be said to have a disorganizing effect on the brain.

Master of Science in
Electrical Engineering
June 1976

Advisor: G. Marmont
Electrical Engineering
Department

Charge and Current Distributions on,
and Input Impedance of,
Moderately Fat Transmitting
Crossed-Monopole Antennas

Elmer Jay McDowell
Lieutenant Commander, United States Navy
B.S.E.E. Purdue University, 1966

Charge and current distributions in the vicinity of the cross junction for several configurations of electrically long, moderately fat crossed-monopole transmitting antennas over a ground plane were measured and compared with the equivalent monopole. The input impedance of these configurations at the ground plane/antenna interface was also experimentally determined. Junction conditions such that there would be a maximum current/minimum charge and minimum current/maximum charge on the vertical monopole were examined. The effect on the input impedance and current/charge distribution of adding resonant and antiresonant horizontal cross members to the junction was investigated and displayed. For purposes of physical understanding, a zero-order explanation was given in terms of the multiple resonances present on the crossed-monopole as compared with the reference monopole.

Master of Science in
Electrical Engineering
March 1976

Advisor: Robert W. Burton
Department of
Electrical Engineering

The Extended Gain Hypole Antenna : An Application of
Computer Modeling to Antenna Design

Charles James Melchioris, Jr.
Lieutenant, United States Navy
B.S.E.E., Pennsylvania State University, 1969

Salih Ahmet Turna
Lieutenant junior grade, Turkish Navy
B.S.E.E., Naval Postgraduate School, 1974

The Hypole is an experimentally developed hybrid dipole antenna for use in land mobile and shipboard communication systems. It employs a unique feed system to provide isolation from the degrading effects of a limited ground plane. This results in an increase in performance over an end-fed half-wave dipole similarly employed. Since the Hypole acts as a half-wave dipole isolated from ground, the possibility of improving its performance by the addition of a second properly phased half-wave-length element exists. A design approach using a thin wire antenna computer program was selected over the more tedious trial-and-error procedures on an experimental development. The validity of a computer model of the Hypole antenna was verified experimentally. This model served as the basis for designing the extended gain Hypole antenna, which when built provided a 2.7 db gain over the Hypole. This study demonstrates the successful application of the computer modeling approach to antenna design.

Master of Science in
Electrical Engineering
September 1975

Advisor: Richard W. Adler
Department of Electrical
Engineering

Study of the Roll and Pitch Transients
in Calm Water
Using the Simulated Performance
of the XR-3 Surface Effect Ship
Loads and Motions Computer Program

Reinhard F. Menzel
Lieutenant Commander, Federal German Navy

Comparison studies of simulated performance of two XR-3 Loads and Motions computer programs are made. Computed pitch and roll behaviour in calm water are investigated. Changes in various subroutine programs are made and justified. Finally an optimal model is selected for future studies and validation.

Master of Science in
Electrical Engineering
December 1975

Advisor: A. Gerba Jr.
Electrical
Engineering
Department

Study of an Integrated Circuit Tapped Delay Line
and Its Applications to Signal Processing

Ang Vong Mongkol
LCDR, Cambodian Navy
B.S., Naval Postgraduate School, 1975

An integrated circuit tapped delay line and its applications to sampled analog processing are studied. The theoretical effort includes the design of sampled analog transversal filters using the techniques developed for digital non-recursive filters. The experimental study includes the evaluation of the new Reticon TAD-12 tapped delay line and its applications as prewhitening, dewhitening and bandpass filters. The frequency domain response and the time domain impulse response are evaluated. The limitations in the device performance and the deviations of filter performance from theoretical analysis are investigated.

Master of Science in
Electrical Engineering
June 1976

Advisor: T. F. Tao
Electrical Engineering
Department

An Integrated System Approach
For Automatic Switching
Radio Telephony

Adhi Widjaja Natahartaka

An implementation of I.C.'s in an automatic switching radio telephony will be presented. Components were chosen to be compatible, however, in some part of the circuit where analog and digital signals are present, or signal levels and impedance of the analog signal produce incompatibility, it is understood that interface elements should be introduced.

Master of Science in
Electrical Engineering
December 1975

Advisor: Gerald D. Ewing
Electrical Engineering
Department

Frequency Analysis Of Human Electroencephalogram
In The Process Of
Performing Specific Tasks

Hugh Pence Parsons
Lieutenant, United States Navy
B.S., University of Iowa, 1968

Reasons for frequency analysis of human electroencephalograms (EEG) are presented. The requirements for a meaningful development of a tasking system is laid out. The frequency spectra of the EEG of subjects taken while they are engaged in mental tasks are presented and analyzed. A concurrent analog record of the subject's performance was also recorded.

It is shown that certain frequencies termed "preferred frequencies," appear in the spectrum picture. These frequencies are characteristic of the subject's response in the tasking situation.

Thus the major result of the research show that preferred frequencies are generated and that these frequencies change according to the subject's activity.

Master of Science in
Electrical Engineering
June 1976

Advisor: G. Marmont
Department of Electrical
Engineering

APPLICATION OF CHARGE COUPLED DEVICES FOR INFRARED SIGNAL
PROCESSING ON THE FOCAL PLANE

Kurt Alfred Pfennig
Korvettenkapitän, Federal German Navy
E.S., Naval Postgraduate School, 1975

Integrated focal plane arrays for thermal imaging are being developed using infrared charge transfer device (IFCID) technology. A hybrid approach is studied where high impedance IR detectors, such as PbS or PbSe, are ac-coupled to a silicon charge coupled device (SiCCD), which is operated in a gain mode as a preamplifier and also as a readout processor. Frequency response of this ac-coupled interface circuit is analyzed. A SiCCD with four input gates is demonstrated experimentally to give an overall gain greater than one. The effect of aliasing on CCD noise due to the sampling process is analysed with emphasis on the bandlimiting mechanism in the surface equilibration input method. Furthermore, ideas for signal processing in the IR focal plane are discussed, such as the frame to frame subtraction, moving target detection and convolutional scanning.

Master of Science in
Electrical Engineering
June 1976

Advisor: Dr. T. F. Tao
Electrical Engineering
Department

A Study of Algorithms to Compute the Discrete Fourier
Transform and Sensitivity Considerations when Implemented
with Sampled Analog Devices

Michael Anthony Pollack
Lieutenant, United States Navy Reserve
E.S.E.E., West Virginia University, 1970

The Fast Fourier Transform (FFT) algorithm has been the most attractive procedure to carry out digital Discrete Fourier Transform (DFT) analysis. However, interest has been generated in two other algorithms, the chirp-z-transform (CZT) and the prime transform (PT), because they are well suited for hardware implementation using the large scale integration (LSI) technologies for sampled analog devices in spectral analysis applications. Digital computer programs for carrying out the CZT and PT were developed. Their results were compared with results computed by the FFT. The sensitivity of their analysis to parametric variations of their hardware implementations was studied by examining their impulse, rectangular, and composite sinusoidal input responses. Variations in the multiplier and in the transversal tap weights were considered.

Master of Science in
Electrical Engineering
June 1976

Advisor: Tien F. Tao
Electrical Engineering
Department

Theory and Sensitivity of Wave-Digital Filter

Ulrich A. Posdziech
Lieutenant Commander, Federal German Navy
B.S., United States Naval Postgraduate School, 1975

It has been conjectured by Fettweis that wave-digital filters designed after doubly terminated ladder networks by means of a transmission line transformation have a low sensitivity against coefficient variation. The theory of wave-digital filters is summarized together with the design procedure for deriving wave-digital ladder structures based upon an analog design. To investigate this conjecture nineteen Chebyshev low-pass filters are realized and experimentally evaluated using the IBM-360 general purpose digital computer. The realization was done in two forms: as wave-digital ladder structures and as recursive digital filter. The sinusoidal steady state response is determined for both filters in floating-point arithmetic with quantized coefficients. The analysis shows the validity of the conjecture for all nineteen cases over a wordlength range of the mantissa of four to twenty-two bits.

Master of Science in
Electrical Engineering
September 1975

Thesis Advisor: S. Parker
Electrical Engineering
Department

The Data General Nova 800 Minicomputer
As a Digital Controller

John William Pounds, Jr.
Lieutenant, United States Navy
B.S.E.E., University of New Mexico, 1970

The Data General Nova 800 minicomputer is described in detail. An analysis is made of its instruction set and a description is given of available peripheral equipment. The specification criteria for A/D and D/A devices is discussed and the selection of specific devices is supported. The DT 1620 data acquisition system and the DT 212 D/A converter are described. The interface considerations for adapting the A/D and D/A converters to the Nova system are discussed. Programming examples for the combined system are given. A system operation tutorial is offered which includes a programmed instruction section to efficiently familiarize the prospective user. Finally, examples of system use as a digital controller are provided.

Master of Science in
Electrical Engineering
September 1975

Advisor: Donald E. Kirk
Department of Electrical
Engineering

Study of a Pulse Counting Discriminator
for FM Signal Demodulation

Djakaria Purawidjaja
Lieutenant Colonel, Indonesian Air Force
B.S., Postal & Telecommunication Academy
Bandung, Indonesia, 1962

The theory of FM communication systems and frequency demodulators is presented. An FM stereo broadcast receiver using integrated circuit components is constructed. A digital frequency demodulator (pulse counting discriminator) is built with solid state components.

The pulse counting discriminator possesses special characteristics and capabilities, i.e.: (1) good linearity, (2) no tuning requirement, (3) wide band operation.

The performance of the pulse counting discriminator in demodulating FM signals is investigated and its capability tested and compared with theoretical results.

Master of Science in
Electrical Engineering
June 1976

Advisor: R. Panholzer
Electrical Engineering
Department

Hydrofoil Simulation in
Six Degrees of Freedom

Jose A. G. Salinas Moreira Ribeiro
Lieutenant, Portuguese Navy

The heeling behavior of a fully-submerged foil hydrofoil craft turning, has been studied by producing a digital computer simulation program, using a Digital Simulation Language on the digital computer IBM system 360/67. The High Point PC(H)-1 is used as the model of this simulation.

Master of Science
in Electrical Engineering
December 1975

Thesis Advisor: G. J. Thaler
Electrical
Engineering
Department

Sampled Analog Recursive Comb Filters
and their Applications to MTI- Radar

Lars Terje Sætre

Lieutenant Commander, Royal Norwegian Navy
B.S., Royal Norwegian Naval Academy, 1964

The design of second order sampled analog filters using Z-transform techniques developed in digital theory was studied. A second order recursive CTD- filter was implemented and investigated. Deviation from theoretical frequency response was found to be partly due to frequency dependent circuitry.

MTI- simulation was performed, and the ability of the CTD- filter to cancel clutter and pass doppler frequencies was demonstrated. Unexplained glitches in the filter output were noted.

Master of Science in
Electrical Engineering
December 1975

Advisor: T. F. Tao
Electrical
Engineering
Department

Probability of Intercept in
Electronic Countermeasures Receivers

Barry Frederick Schwoerer
Lieutenant, United States Navy
B. S., San Jose State University, 1968

Modern electronic warfare systems are directed against an ever increasing variety of electronic systems. It is necessary to intercept certain signals so that countermeasures or analysis can be accomplished. To accomplish the intercept, receiving systems with as high a probability of intercept as possible are required. This study examines factors causing probability of intercept to decrease and the methods that may be used to combat those factors. Receiving systems having unity probability of intercept are examined. Systems examined are the IFM, acoustooptic and two-tuple type receiver. The effects of external and internal noise, receiver and antenna scan factors, signal density, signal processors, display systems and bandwidth are factors limiting probability of intercept that are examined. One concludes that through proper design, systems can be achieved with unity intercept probability.

Master of Science in
Electrical Engineering
December 1975

Advisor: S. Jauregui, Jr.
Electrical Engineering Department

Analysis of the Parameters Required for
Performance Monitoring and Assessment
of Military Communications Systems
by Military Technical Controllers

by

Roy Martin Shoemaker
Captain, United States Marine Corps
B.S., University of Washington, 1969

The purpose of this thesis is the determination and analysis of the specific parameters required for performance monitoring and assessment of military communication systems by military technical controllers. These parameters if measured and analyzed correctly will allow military technical controllers to anticipate difficulties and permit appropriate corrective action before actual failure of the communications system. The three areas from which these parameters are derived are: level, noise and distortion.

The unsuitability of current instruments to provide quality assurance of the numerous circuits appearing at technical control facilities is discussed and a dedicated, task oriented, combination measuring set is evaluated as to its ability to measure the parameters that have been determined.

Master of Science in
Electrical Engineering
December 1975

Advisor: Eugene J. Normand
Electrical Engineering
Department

Instrumentation Package
for
Measurement of Shipboard RFI

Allen Ray Shuff
Lieutenant, United States Navy
B.S., North Carolina State University, 1970

Shipboard RFI to UHF SATCOM is a potential threat to effective Naval Communications. To determine the extent of this threat and to develop corrective measures, it was necessary that tests be performed to characterize the RFI in the UHF band in which the Fleet Satellites operate.

The requirement existed for an instrumentation package having a low noise figure, a large dynamic range, and the capability of rapid field maintenance.

The instrumentation package was designed and constructed at the Naval Postgraduate School, Monterey, California. The design conforms to practices which lead to good electromagnetic compatibility. The design met all design criteria and has been successfully used in collecting data to characterize shipboard RFI to UHF SATCOM.

Master of Science in
Electrical Engineering
June 1976

Advisor: John E. Ohlson
Electrical Engineering
Department

A Comparative Study on the Realizability
of Biquadratic Functions

Achmad Ischak Suparman
Lieutenant Colonel, Indonesian Air Force
B.S., Posts & Telecommunications Academy
Bandung, Indonesia, 1963

A comparative study is made on the realizability conditions of various special cases as well as the general case of the positive-real biquadratic functions. Computer programs are written for this study to illustrate the realizability regions of zeros (or poles) of the functions. A limited study is also made on the sensitivity of the function to variation of element value in a realization.

Master of Science in
Electrical Engineering

June, 1976

Advisor: Shugar Chan

Electrical Engineering
Department

Backfire Antenna with a Twist Reflector

Edi Tampubolon
Lieutenant, Indonesian Navy
M.S., Odessa Polytechnical Institut, 1967

The backfire antenna in this work incorporates a twist reflector in place of simple secondary reflector for the purpose of generating a circularly polarized wave. Measurements of far-field patterns are given.

Master of Science in
Electrical Engineering
September 1975

Thesis Advisor: R. W. Adler
Electrical Engineering
Department

Approximate Analytical Evaluation
of
Extended-Kalman Filters

Hasan Oner Tasdelen
Lieutenant, Turkish Navy

Analytical equations derived for evaluating linear estimators are applied to extended-Kalman filters for approximate performance evaluation. Two cases were considered, a single known target trajectory and multiple target trajectories with given probabilities of occurrence. For the multiple-trajectory case, equations are derived for the mean and covariance of estimation error in terms of the conditional expectations. Two examples are presented to compare the use of the analytical equations with Monte-Carlo simulation.

Master of Science in
Electrical Engineering
December 1975

Advisor: Donald E. Kirk
Department of
Electrical Engineering

REDUCED ORDER APPROXIMATIONS TO HIGHER ORDER LINEAR SYSTEMS

Jerry D. Thompson

Lieutenant, United States Navy

B.S., University of New Mexico, 1971

Low order models are derived by a computer program technique which utilizes the Routh Approximation Method of analysis. Comparisons are made between this method and that of the Dominant Pole Method and the Iterative Optimization Method of analysis.

Low order models are developed from higher-order, linear systems and compared to that system in response to input excitations consisting of a Step and a Ramp.

Graphical displays and numerical tables provide a basis for error analysis and comparisons between the approximation techniques.

Master of Science in
Electrical Engineering
June 1976

Advisor: A. Gerba Jr.
Electrical Engineering
Department

The Singular Surface in the Parameter Space; Applications

by

Paul Franklin Van Tassel
Lieutenant, United States Navy
BSEE, Purdue Univeristy, 1970

The basic theory of the parameter plane and the singular line is reviewed. Previously unknown properties of the singular line and its relationship to the parameter plane are introduced.

The singular surface, a hypersurface of singular values in the parameter plane, is introduced.

Compensation techniques using the singular line are demonstated and a computer program for determining the existance of singular lines is presented.

Master of Science in
Electrical Engineering
December 1975

Advisor: George J. Thaler
Department of
Electrical Engineering

Measured Effects of Frequency Division
on the Performance of Pulse Counting Frequency Demodulators

Duong Tuan Viet
B. S. Vietnamese Military Academy, 1970
B.S.E.E. Naval Postgraduate School, 1975

The measured performance of frequency demodulators that use frequency division before demodulation is presented. Digital data (square wave modulating signal) is used in the experiment. This binary signal permits a quantitative measure of performance, namely probability of error in recovering the data.

Noise is added to a carrier that is frequency modulated by the square wave data. The recovered waveform at the demodulator output is compared with the original data and errors are counted. The results are presented as a plot of probability of error vs ratio in decibels of signal power to noise power. Results for frequency division by factors of 1,2,6, 8 and 12 are given.

From the experimental results, it is concluded there is no significant improvement in system performance with frequency division.

Master of Science in
Electrical Engineering
June 1976

Advisor: Glen A. Myers
Department of
Electrical Engineering

Computer Automated Design
of
Systems

Larry Paul Vines

Lieutenant, United States Navy

B.S.E.E., Purdue University, 1970

An automated digital computer technique of control system design is presented. The emphasis is on compensator design but the method is applicable to the design of any system with free parameters. Signal representation and system response are in the time domain.

The inputs required from the engineer are the system configuration, the desired output response and the free parameters. A parameter minimization routine is then used to minimize a specific cost function and to set the free parameters. A graphical output of the desired response and actual system response is then produced for comparison by the engineer.

Master of Science in
Electrical Engineering
June 1976

Advisor: George J. Thaler
Electrical Engineering
Department

An Analysis of the
Response of Digital Demodulators
to Frequency Shift Keyed Signals

Myron Wasiuta
Captain, United States Marine Corps
B.S.E.E., Pennsylvania State University, 1968

The theory and operational characteristics of a digital pulse counting frequency demodulator are presented. The demodulator, called the pulse width demodulator (PWD) in this report, is realized with solid state components and uses pulse circuitry to perform demodulation. The output of the demodulator may be applied to a low pass filter (LPF) to recover the modulating voltage.

The PWD possesses the following properties: (1) wideband operation, (2) no tuning requirement, (3) simple resistor adjustment for selecting the operating frequency range and (4) ability to operate at frequencies beyond the design range due to the circuit's ability to automatically frequency divide.

The demodulator performance for analog and digital (FSK) modulating voltages is obtained at both commercial intermediate frequencies of 455 kHz and 10.7 MHz. Its performance in the presence of noise is investigated and compared to theoretical results for non-coherent FSK systems.

Master of Science in
Electrical Engineering
December 1975

Thesis Advisor: G. A. Myers
Electrical Engineering
Department

MEASURED SURFACE CHARGE AND CURRENT DISTRIBUTIONS
ON SCATTERING RECTANGULAR PLATES

by

Hans-Joachim Wiedemann
Lieutenant Commander, Federal German Navy

This work describes the measurement of surface charge and current distribution on rectangular conducting plates under monochromatic, electromagnetic illumination. Different plate widths and angles of incidence are investigated. The results are graphed, analyzed and compared to theoretical computations.

MASTER OF SCIENCE IN
ELECTRICAL ENGINEERING
June 1976

Thesis Advisor:
R. W. Burton
Electrical Engineering
Department

Surface Search Radar Tracking
by a
Microcomputer Kalman Filter

Charles Howard Wilson
Lieutenant, United States Navy
B.S., University of Idaho, 1970

U. S. Navy ships not equipped with NTDS currently perform surface radar target tracking manually, a tedious and inaccurate process.

This thesis establishes that an 8-bit microprocessor, interfaced to a common surface search radar, could compute the course and speed of multiple radar targets. The investigation includes the estimation of radar measurement errors, a determination of practical digital interface limitations, and the development of a Kalman filter algorithm, a floating point arithmetic library for the INTEL 8080 microprocessor, and the microprocessor tracking system software. The error statistics and execution time of the microprocessor software are presented for several computer simulated target tracks.

Master of Science in
Electrical Engineering
June 1976

Advisor: V. M. Powers
Electrical Engineering
Department

Fundamentals and Applications
of
Integrated Circuits

Daniel L. Wojtkowiak
Lieutenant Commander, United States Navy
B.S.E.E., Naval Postgraduate School, 1974

A training program in the fundamentals and applications of integrated circuits has been developed. The program is designed for independent study and contains coordinated laboratory exercises used to reinforce each subject. The exercises are performed on an Analog/Digital Trainer, which consists of a group of modules and an integrated circuit Breadboard. Circuits described in the individual lessons are quickly realized on the Trainer to provide the student with valuable "hands-on" experience. Two sections have also been included which describe additions to the basic Trainer design.

Master of Science in
Electrical Engineering
December 1975

Advisor: R. Panholzer
Department of
Electrical Engineering

A Magnetometer Data Acquisition System

Constantine Louis Xefteris
Lieutenant, United States Navy
B.S.E.E., Marquette University, 1971

A system for the analysis of geomagnetic and gradient noise is described. The nominal 176 kHz Larmor frequency output of an optically pumped cesium magnetometer is mixed to a frequency in the 1.2 kHz range and FM tape recorded. The recorded output is applied to a periodmeter, the digital output of which is input to the XDS-9300 computer for analysis and display. The absolute accuracy of the period measurement is $.75 \mu\text{sec}$ with a resolution of $.25 \mu\text{sec}$. The RMS noise of the tape recorder was determined to be $.667 \mu\text{sec}$ or in the operating frequency range less than 1 Hz or $.28 \text{ gamma}$. Externally introduced field disturbances as small as $.5 \text{ gamma}$ were recorded and displayed, and the response time of the magnetometer determined to be less than 2.5 msec.

Master of Science in
Electrical Engineering
June 1976

Advisor: G. L. Sackman
Electrical Engineering
Department

Solid-State Digital In-Situ

Acoustic Data Acquisition

David Michael Craig

Lieutenant, United States Navy

B.S.E.E., North Carolina State University, 1967

Electrical Engineer, North Carolina State University, 1967

The problems of acoustic environmental data recording are studied to develop an alternative to conventional magnetic-tape digital storage for in situ recording instruments. Various physical data transducers are analyzed to determine which types are best suited for portable solid-state environmental recorders, and a discussion of information processing concentrates on the problems of high-density versus low-density digital data storage and on methods for effecting large-scale data reductions. Recent advances in integrated-circuit electronics are evaluated in terms of suitability for use in instrumentation requiring both large-scale memory capacity and low power consumption. Results of the research include functional block diagrams of an ambient sea-noise recorder and a shipping-container impact recorder.

Master of Science in
Engineering Acoustics
December 1975

Advisor: V. Michael Powers
Electrical Engineering
Department

Submarine Radiated Noise Far-Field Beam Patterns for
Discrete Frequencies from Near-Field Measurements

Frederick Roberts Crawford
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1964

A theoretical model was developed which can predict discrete frequency far-field radiation patterns of submerged submarines from near-field measurements. The model developed utilizes the Helmholtz integral equation and the assumptions of the DRL method of near-field measurements. The DRL working formula is further modified by using a plane surface of integration and restricting the far-field points of interest to a horizontal plane containing the source. These assumptions and restrictions lead to a mathematical solution of the Helmholtz equation which is in the form of a Fourier transform. Near-field measurements on a horn speaker in an anechoic chamber were taken and the far-field beam pattern predicted by the model developed, using a simple computer program containing a Fourier transform routine. Computed beam patterns were in satisfactory agreement with measured far-field beam patterns, errors being concentrated in the outer side lobes from the acoustic axis. Problems which would be encountered in applying this model to at sea acoustic measurements are discussed. Methods for utilizing this model on an instrumented acoustic range to make underway radiated noise measurements on submarines are presented.

Master of Science in
Engineering Acoustics
December 1975

Advisor: G. L. Sackman
Electrical Engineer-
ing Department

Investigation of Subharmonic Generation
by Finite-Amplitude Waves
in a Rigid-Walled Tube

John Jay Donnelly
Ensign, United States Navy
B.S., United States Naval Academy, 1975

Finite-amplitude standing waves contained within an air filled rigid-walled tube at ambient temperature and pressure were investigated experimentally. The pressure waveform in the tube was analyzed for subharmonic content for comparison with several existing theoretical models. Due to limitations of the experimental apparatus, the only model for which the predicted threshold for subharmonic generation could be exceeded was that of Coppens which predicts subharmonic generation when the strength parameter exceeds 2.0. Strength parameter is defined as $M_2\beta Q_1$ where M_2 is the Mach number of the driving frequency, $\beta = 1.2$ in air, and Q_1 is the quality factor associated with the subharmonic resonance. Strength parameters up to 2.89 were investigated and no threshold effect was observed.

Master of Science in
Engineering Acoustics
June 1976

Advisor: James V. Sanders
Physics Department

Finite Amplitude Effects in Rectangular
Cavities with Perturbed Boundaries

Milo Jethroe Kilmer, II
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

The effects of boundary perturbations on finite-amplitude acoustical standing waves in rectangular, rigid-walled cavities were investigated using non-linear theory. When a high amplitude standing wave of frequency ω is generated in a cavity, non-linear effects will cause a stimulation of certain normal modes whose resonance frequencies are integer multiples of ω . Previous experimental observations revealed that there could be excitation of other normal modes, not belonging to the family of the driven mode, which was not predicted by the non-linear theory.

The purpose of this research was to investigate the possibility that deviations from the idealized geometry could account for these observations. Of the various mechanisms possible, this work investigated the possibility of these unpredicted excitations occurring through a non-linear mechanism.

The standing waves that exist in an ideal cavity must be corrected when the boundaries are irregular. The non-linear interaction between these standing waves and the corrections was studied. The ability of this interaction to excite standing waves other than those predicted in the ideal case was verified. A specific example was worked out demonstrating an unpredicted excitation, the strength of which was on the order of the magnitude of the boundary perturbation parameter.

Master of Science in
Engineering Acoustics
December 1975

Thesis Advisor: A.B. Coppens
Physics and Chemistry Department

The Effects of Simple Boundary
Irregularities on Acoustical Mode Propagation
in Ducts with Pressure Release Boundaries

Luis Fernando Pereira da Silva Nunes
First Lieutenant, Portuguese Navy

Effects of boundary irregularities on acoustical mode propagation in ducts, with pressure release walls are theoretically studied. Several particular wall irregularities are explored: Sinusoidal, δ -function and spatially decaying wall perturbations. Strong effects (resonances) appear in the case of the sinusoidal wall. In the other two cases, the resonances are not present, but there are still traveling disturbances whose effects can be important at great distances from the wall irregularity.

Master of Science in
Engineering Acoustics
December 1975

Thesis Advisor: A.B. Coppens
Physics and Chemistry
Department

Radiation Pattern Shaping of a Two-Element,
Concentric Ring Transducer Using
Phase and Amplitude Shading

Albert Hampden Proctor Shaw
Lieutenant Commander, Canadian Forces
B.Sc.E.E., University of Manitoba, 1964
B.Sc.E.A., Naval Postgraduate School, 1975

A high-frequency transducer which gives usefully uniform radiation into a half space is required for use as a target locator in an underwater acoustic range. Phase and amplitude shading of a two-element transducer consisting of a central circular piston and a concentric annular ring has been proposed to meet the requirement. A transducer resonant at 74 kHz but scaled in terms of wave length to 25 kHz in the transverse dimension has been constructed and tested at both frequencies. Exceptionally wide radiation patterns with major lobe widths of the order of 150 degrees (10dB down) were obtained. At the scaled frequency computer model predictions based on simple theory agreed well with the measured radiation patterns. At the resonant frequency, however, predicted secondary lobe details were not found in the patterns. These discrepancies have been attributed to the non-uniform motion of the radiating surfaces due to mutual coupling effects through the transducer structure and the transmission medium. In spite of these minor problems associated with the prototype transducer, promising results have been obtained and have shown the design concept to be a valid and viable one.

Master of Science in
Engineering Acoustics
December 1975

Advisor: O. B. Wilson
Physics and Chemistry
Department

Finite-Amplitude Standing Waves
in
Real Cavities Containing Degenerate Modes

Winfield Scott Slocum IV
Lieutenant, United States Navy
B.S., Ohio State University, 1969

Finite-amplitude standing waves in air at ambient temperatures contained within a rigid-walled rectangular cavity having one variable interior dimension were experimentally investigated. The effect of degenerate or nearly degenerate configurations on the harmonic content of the observed pressure waveform was compared to the theory of Coppens and Sanders as modified to include empirically determined losses and resonances. Second and third harmonic distortion for both degenerate and nondegenerate cavity configurations were recorded as continuous functions of frequency in the vicinity of the resonances for the 100 and 110 modes. It was found that in rectangular cavities having walls free of any perturbation, the theoretical model can accurately predict both shapes and amplitudes of the harmonic content of the finite-amplitude standing wave whether or not degeneracies are present.

Master of Science in
Engineering Acoustics
December 1975

Advisor: James V. Sanders
Dept. of Physics & Chemistry

Project Manager and Test and Evaluation Facility Relationship

Kenneth Dean Aanerud
Lieutenant Commander, United States Navy
M.S.A.E., Naval Postgraduate School, 1974
and

John Edward Kane
Lieutenant, United States Navy
M.S.A.E., Naval Postgraduate School, 1974
and

Michael Bernard Kelley
Lieutenant, United States Navy
M.S.A.E., Naval Postgraduate School, 1974

This thesis investigates the relationship between Washington based Project Managers and a Test and Evaluation (T&E) facility, the Pacific Missile Test Center (PMTTC). Five areas of the relationship are examined. First, the formal weapon system acquisition process as prescribed by current directives is presented as an overview. Next, the Pacific Missile Test Center organization is analyzed. This is followed by an investigation of funding techniques, and specifically, those employed by PMTTC. The Project Managers' perception of their participation in the T&E process is presented through results of a questionnaire. Finally, an objective method of selecting the appropriate T&E facility for a project based on technical capability is developed.

Master of Science in Management
September 1975

Advisors: John W. Creighton
James A. Jolly
Operations Research and Administrative Sciences Department

Examining Problems of the Current
Military Compensation System :

A SALARY - BASED PROPOSAL

Robert M. Acker
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1969

William J. Metzger Jr.
Lieutenant Commander, United States Navy
B.S., Wisconsin State University: Stevens Point, 1964

An examination of the "pay and allowances" military compensation system in the All Volunteer Force setting is presented. Focusing on a single pay element, Basic Allowance for Quarters, and the military family housing subject, careful study reveals a costly anachronism. The misperceptions and consequences of inequality, complexity and difficult adjustability plaguing the military are discussed. The recommended reform suggested is that a military salary be adopted to replace the existing system.

Master of Science in
Management
June 1976

Advisor: John D. Finnerty
Department of Mathematics

The Development of Uniform International Accounting
An Enquiry into the Problems, Progress and Prospects

Suleiman Mumtaz Ahmad
Commander, Pakistan Navy
B.S., Pakistan Naval Academy, 1972

The last three decades have witnessed a rapidly growing internationalization of business activities. Because the accounting standards and practices of different countries have developed in response to diverse environments, accounting has developed with strong national accents. Consequently, an enterprise with investments in many countries has difficulty in achieving a consolidated financial report from a multiplicity of accounting practices. Further, the investors in these enterprises find it difficult to understand and evaluate the financial statements developed from a wide range of accounting standards.

The accounting profession has addressed itself to these problems at recent international congresses of accountants. It established the International Coordination Committee for the Accounting Profession and the International Accounting Standards Committee with the specific objective of developing uniform international accounting standards.

This study has evolved from a scrutiny of the growing wealth of literature that concerns itself with the problems of international accounting. This study leads to a conclusion supporting the development of uniform international accounting.

Master of Science in
Management
December 1975

Advisor: James M. Fremgen
Operations Research
and Administrative
Sciences Department

ANALYSIS OF THE CORRELATION BETWEEN
PSYCHOLOGICAL VARIABLES AND
U.S. NAVY OFFICER PROMOTION

by

John Francis Anderson
Lieutenant Commander, Supply Corps, United States Navy
B.A., Colgate University, 1963

Raiford Wilson Cooper, Jr.
Lieutenant, Supply Corps, United States Navy
B.A., Birmingham-Southern College, 1966

This thesis studies the relationship between promotion patterns in the United States Navy and psychological test data available on a group of former Naval Postgraduate School students. It is hypothesized that personality characteristics and intelligence indicators are related to promotability and from this it is inferred that these indicators can be utilized in predicting a successful Naval career.

Pearson product-moment correlations which related each of the 50 test variables to a promotion index were analyzed. Nine of the personality variables were found to be statistically significant at the .05 level or greater. Additionally, a multiple correlation stepwise regression analysis was conducted which resulted in a correlation of .426 ($N = 205$).

Master of Science in
Management
June, 1976

Advisors: Dr. John D. Senger
Dr. Ronald A. Weitzman
Operations Research and
Administrative Sciences

A Secure Voice System With Bandwidth Reduction

by

Fidel L. Baca
Lieutenant Commander, United States Navy
B.A., Naval Postgraduate School, 1970

The need for secure voice communication systems is increasing both in the civil and military arenas. Coupled with this is the need for conserving bandwidth, increasing performance, and reducing costs. Currently used secure voice methods are relatively antiquated and do not provide desired performance and bandwidth conservation without incurring increasing costs. A new system, proposed herein offers bandwidth reduction, increased performance, and decreasing costs while using modern digital techniques as opposed to analog techniques. The proposed system, known as VOCOM, operates in existing voice bandwidths using existing equipment, and offers a higher level of privacy and security while at the same time simplifying software handling. Additionally, the proposed system offers the user real-time operation to enhance critical decision-making.

Master of Science in
Management
March 1976

Advisor: O. M. Baycura
Department of Operations
Research & Administrative
Sciences

The Question of Retirement: An Examination of the
Factors Relevant to the Retirement Decision of
the Individual Naval Officer

Donald Freeman Berkebile
Lieutenant Commander, United States Navy
B.S., U.S. Naval Academy, 1966

and

Robert David Gaudi
Lieutenant, United States Navy
B.A., Southern Illinois University, 1968

One situation confronting a military officer is that at some point he must retire either voluntarily or involuntarily. Under certain conditions he may have to make a transition to a second career. Given this transition, substantial advance planning should be undertaken to determine, from the range of retirement opportunities available, the optimum time at which to retire in order to achieve his personal goals. Particular factors that the potential retiree should consider prior to electing voluntary retirement were developed. A present value analysis was used to present various financial options related to the officer's marketability in the civilian sector, his military career, and personal goals. No decision on the most opportune retirement point was reached or intended. It was concluded that the voluntary retirement decision is completely individual and not clear cut and that extensive planning is required prior to retirement.

Master of Science
in Management
June 1976

Advisor: L. Darbyshire
Department of
OR/AS

An Investigation of the Lifestyle of Coast Guard
Lower Enlisted Grade Families concerned specifically
with Housing, Benefits, and Use of Related Coast Guard
Programs.

Robert Byron Bower
Lieutenant, United States Coast Guard
B. S., United States Coast Guard Academy, 1968

Seventeen Coast Guard families were interviewed concerning their housing, military benefits, and use of Coast Guard programs. Interviews were conducted in the families' homes. The Service members were attached to eight Coast Guard commands in the greater San Francisco/Oakland area. Knowledge of programs and use of benefits were quantified from interview responses to pin point areas for consideration in present and future housing programs.

Master of Science in
Management
December 1975

Advisor: R. A. Weitzman
Dept. of Operations
Research and
Administrative Science

Guided Missile Frigate
Combat System Land-Based Test Site
Lessons Learned

Gary Albert Bush
Lieutenant Commander, United States Navy
BSEE, MSEE, Purdue University, 1965

The Guided Missile Frigate (FFG) program evolved in an era of increased concern about the acquisition of weapons systems by both the executive and legislative branches of government. This thesis outlines the major studies that were an outgrowth of the concern and identifies one crucial problem as test and evaluation, particularly operational test and evaluation. This thesis follows the requirements of the test and evaluation directives that were promulgated during the evolution of the FFG program.

A Combat System Land-Based Test Site was constructed as a part of the Guided Missile Frigate program. The Combat System Test Site has been through Initial Operational Test and Evaluation. The requirement for operational test and evaluation affects significantly the test site's original objective of system development and integration. This lesson and other lessons learned at the Combat System Test Site are presented as they relate to the test and evaluation directives.

Master of Science in
Management
March 1976

Advisor: Michael G. Sovereign
Operations Research and
Administrative Science
Department

RELATIONSHIPS AMONG FILL-RATES AND INFLUENCING VARIABLES
IN AN AERONAUTICAL RECOVERABLE ITEM ONE-FOR-ONE EXCHANGE
INVENTORY SYSTEM

Paul Kyle Butler

Lieutenant Commander, Supply Corps, United States Navy
B.S., Auburn University, 1959

Cameron Rathbone Gray

Lieutenant Commander, Supply Corps, United States Navy
B.A., University of New Mexico, 1965

The one-for-one exchange inventory and resupply systems for aeronautical recoverable assemblies can be described by a simple stochastic model. Such a model relates fill-rates and the three major variables affecting fill-rates: failure rates, on-hand quantity, and restoration/replenishment time. Utilizing this model the decision-maker can predict fill-rates given a set of variables, or select parameters for one or more of the variables to give predetermined fill-rates. This thesis describes the model, illustrates its use, and analyzes selected programs/parameters now in effect in operating sites and in the Navy-wide system.

Master of Science in
Management
June 1976

Advisor: C. P. Giffried
Operations Research and
Administrative Sciences

Communicating By Satellite

Robert Earl Byrd
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

This paper covers some of the basic topics encountered by the communications manager faced with the task of familiarizing himself in the rapidly growing field of Communications Satellites. It is not intended to be an in-depth discussion but rather a brief introduction to the ionosphere, the decibel measurement system and some very basic rocket and space mechanics. Commercial ventures by INTELSAT have been most successful in this field and, for that reason, a section on INTELSAT and its progress has been included. Finally, a glossary of useful satellite terminology is included to supplement other available sources of information.

Master of Science in
Management
September 1975

Advisor: O.M. Baycura
Department of
Operations Research
Administrative
Sciences

An Analysis of Age and
Performance Among Communications
Personnel

James M. Carter
Lieutenant Commander, United States Navy
B.A., Los Angeles State College, 1963

This thesis utilized longitudinal and performance appraisal information on 182 naval telecommunications personnel from two Naval Communication Stations and an Attack Carrier to develop a career development model and high performance characteristics. High correlation between age and paygrade, mean time between advancements, and years since last advancement; and weak correlation between age and job index, and evaluation scores were noted. When scored on an "all or nothing" basis the 31-36 year age-group received a significantly higher mean score on the evaluation questionnaire than the 37-42 year age-group. This may be interpreted as early low performance among the personnel sampled for this study.

Master of Science in
Management
September 1975

Advisor: C. B. Derr
Department of Operations
• Research & Administrative
Sciences

ECONOMIC EFFECTS OF ENFORCEMENT VARIABLES
ON
COMMERCIAL OIL POLLUTION CONTROL STRATEGY

Roger Charles Cook
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1970

An economic decision model for oil pollution control strategy is developed and applied to data taken from the Coast Guard's Pollution Control Incident Reporting System. The model and analysis show the impact of civil penalties, cleanup costs and internal costs on a firm's pollution control strategy. Civil penalties appear to have the largest effect on controlling minor spills, while internal costs become increasingly important to the firm's decision to control larger spills. Notes are included on the PIRS data base and development of an oil spill incident cost model.

Master of Science in
Management

September 1975

Advisor: K. L. Terasawa
Department of
Administrative
Science

Language Differentiation Based On
Sound Patterns of the Spoken Word

Roger Darrell Cook
Lieutenant, United States Navy
B.S.E.E., University of New Mexico, 1971

A categorical analysis was made of five languages. The sounds of speech were simulated using written text converted via International Phonetic Alphabet (IPA). The sounds of speech were identified as members of fricative, nasal, stop, or vowel categories. A statistical analysis was performed on categorical content of one (at various positions in the word), two, and three sound combinations.

Several attempts to achieve a differentiation scheme were made before any success was realized. Two methods for developing conditional expectation are compared; Bayes' Conditional Probability Rule, and Cook's Prognostic Progression.

Statistical analysis and "loop" tests indicated that languages do have unique patterns and can be differentiated on the statistics contained in the first three sounds. 100% correct decisions were achieved for as few as five words in the loop test. Limited base data negated result significance beyond three successive sounds.

Master of Science in
Management
March 1976

Advisor: S. Jauregui
Electrical Engineering
Department

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NAVAL POSTGRADUATE SCHOOL MONTEREY CALIF
ABSTRACTS OF DISSERTATIONS, THESES AND RESEARCH PAPERS SUBMITTED--ETC(U)
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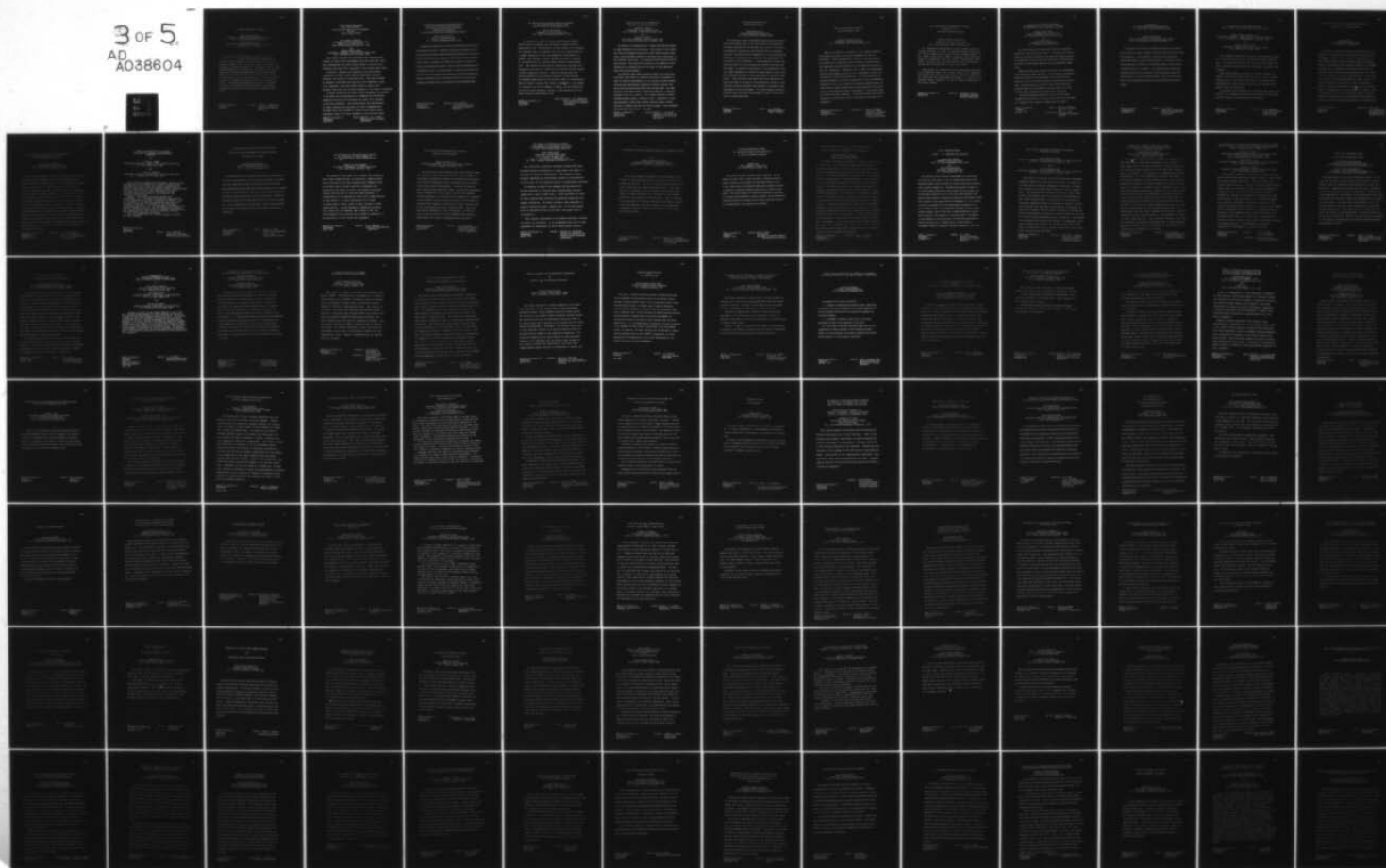
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AN ANALYSIS OF GROUP VIII TRAINING

Vernie Richard Coston
Lieutenant Commander, Civil Engineer Corps, U.S.N.
B. S., North Carolina State College, 1960

Bruce Lawellin Jackson
Lieutenant Commander, Civil Engineer Corps, U.S.N.
B. S., University of Kansas, 1960

This paper analyzes and compares the methods by which training requirements for SEABEES (Group VIII ratings) are determined and training resources allocated. The major observation is that two different strategies exist. CNO (OP-099) tends to be concerned with the numbers of personnel on-board and the anticipated gains and losses, whereas CINCPACFLT and CINCLANTFLT view the problem in the near time frame, being concerned with deficiencies which may degrade SEABEES readiness. The approach taken is to first provide background data on the structure of the Group VIII ratings, the manner in which these personnel are employed, and the existing systems for managing their training. Training responsibilities are identified, and problems which exist in the current systems are presented. The analysis emphasizes environmental, cost, efficiency and management control factors.

Master of Science in
Management
June 1976

Advisor: Jonathan C. Tibbitts, Jr.
Operations Research and
Administrative Sciences
Department

Public Works Management
Role and Structure:
Activity and Staff Civil Engineers
in the
Public Works Center

Don Carroll Crumbley
Commander, United States Navy, CEC
Bachelor of Architecture
Texas Technological University, 1960

and

Robert Edward Gagen
Lieutenant Commander, United States Navy, CEC
B.S., University of Illinois, 1965

This thesis explores the structural and organizational changes in public works management which have had some unforeseen consequences for Public Works Centers, Activity Civil Engineers and Staff Civil Engineers in the United States Navy.

Initially, research was conducted by written survey, compilation of Public Works Centers Commanding Officers' comments, and review of historical data. This was followed by personal interviews with Activity Civil Engineers, Staff Civil Engineers, and Public Works Center's senior Civil Engineer Corps and civil service managers in San Diego, California.

Findings concerning the public works management environment in the Navy and the perceptions of Commands and individuals regarding Activity Civil Engineer and Staff Civil Engineer billets are presented. The relationships and implications of these findings are discussed and some recommendations are made which are intended to improve total public works management support of Fleet commands in the unilinear Navy.

Master of Science in
Management
June 1976

Thesis Advisor: W. J. Haga
Administrative Sciences
Department

Measurement of Increase in Managerial Ability
Resulting from Graduate Level Education
of Technically Oriented Federal Employees:
a Review and Proposal for
the Naval Air Federal Executive Management Program

Verlyne Wayne Daniels
Captain, United States Navy
B. S., Naval Postgraduate School, 1966

Background information on the Naval Air Federal Executive Management Program is provided. Managerial skills and the manager's job are discussed and described; various strategies and designs for evaluation of training and education are reviewed; a brief overview of the assessment center is given, including a description and comments on validity, on selection and training of assessors, and on design and establishment of an assessment center. A recommendation is made that consideration be given to the use of an abbreviated assessment center for measurement of change in management skill resulting from graduate level education in the Naval Air Federal Executive Management Program (NAVAIR FEMP).

Master of Science in
Management
December 1975

Advisor: J. W. Creighton
Operations Research and
Administrative Sciences
Department

An Application of Static Marginal Analysis
In the Generation of a U.S. Navy
Repair Material Requirements List

Gerald Lee Devins
Commander, United States Navy
B.S., Naval Postgraduate School, 1965

An analysis is made of current Single Supply Support Control Point procedures for developing a Repair Material Requirements List. The objective of this thesis is to minimize the expected cost of stockouts over all line items subject to a budget constraint, given the probability distribution of demand. The concept of static marginal analysis is applied in the generation of a revised Repair Material Requirements List. The revised and the present generation techniques are compared by the use of a simulation of a R3350 aircraft engine overhaul production facility. Results indicate that the Poisson probability distribution function closely matches the demands experienced on the contract used for investigation. Results further indicate that drastic reductions in the number of stockouts, and in the number of orders, can be effected by the use of static marginal analysis in the generation of the Repair Material Requirements List.

Master of Science in
Management
June 1976

Thesis Advisor: A.W. McMasters
Administrative Science
and Operations Research
Department

Alpha Control and Its Mediating
Effects on Pain and Anxiety

Robert R. Dunne
Lieutenant, United States Navy
B.A., College of the Holy Cross, 1968

and

Scott B. Dudley
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

The purpose of the experiment was to examine the mediating effects of alpha brainwaves on pain and anxiety. Three groups of five subjects each received biofeedback training with either alpha brainwaves (alpha group), the pre-recorded brainwaves of the alpha group (yoked group), or beta brainwaves (beta group). All subjects believed they were receiving alpha training. Their subjective evaluation of the intensity of cuff-induced pain was recorded along with the amount of alpha generated, pulse rate and blood pressure.

The alpha and yoked (alpha brainwaves randomly and intermittently reinforced) groups showed no significant difference in enhancement of alpha over baseline measurements or in the reduction of blood pressure and pulse rate (physiological indicators of anxiety), however, both groups performed significantly better than the beta group. The alpha group was significantly better in controlling alpha and in increasing tolerance to pain over trials ($p < .10$), however there was no overall difference between groups in tolerance to pain. Regardless of initial group assignment, "high" alpha producers generally showed a greater tolerance to ischemic pain than "low" alpha producers. Group differences were significant only at the $p < .20$ level.

Master of Science in
Management
March 1976

Thesis Advisor: T.A. Wyatt
Operations Research and
Administrative Sciences
Department

An Intelligence Doctrine for
Unconventional Warfare

Donald Gene Eirich
Major, United States Marine Corps
B.S., United States Naval Academy, 1960

The traditional military intelligence doctrine was found to be deficient with regard to many of the unique aspects of the Vietnam War. This thesis concluded that the deficiency was a result of the difficulty encountered in applying the traditional doctrine to the unconventional war. Upon examining this incompatibility, it was found that the differences in the nature of the conventional and unconventional missions were of critical importance. In the conventional situation, the mission was explicit; in the unconventional situation the mission was often vague. In response to the ambiguity of the unconventional situation, combat commanders were required to develop specific tactical missions that would contribute to the accomplishment of the overall vague mission. Since traditional intelligence doctrine was designed to respond to the specific missions of the unconventional situation, it was found that traditional procedures were incapable of responding to the requirements of mission development. This thesis proposes a doctrinal alternative that facilitates the development of specific tactical missions for unconventional wars.

Master of Science in
Management
June 1976

Advisor: C. P. Gibfried
Operations Research
& Admin. Sciences

PPBS in Developing Countries
The Philippines Case

Plaridel Comentan Garcia
Commander, Philippines Navy
B.S., Philippines Military Academy, 1959

PPBS is analyzed as to whether it can improve planning and budgeting as well as general management in the R.P. government. PPBS fundamentals, evolution, and experiences with emphasis on areas where difficulties of understanding and compliance were encountered are discussed and related to the R.P. conditions. Important uses of PPBS for development planning and budgeting as well as to complement on-going administrative reforms are presented. The structural and information aspects of PPBS are suggested as being implemented informally in R.P. as a result of on-going administrative reforms which include reorganization and preparation for shifting to a parliamentary form of government, a form where PPBS is found to be more suitable. A slow and feasibility testing approach to implementing PPBS in developing countries is recommended.

Master of Science in
Management
December 1975

Co-Advisors: John E. Dawson
William T. Haga
Operations Research
& Administrative
Sciences Department

The Requirements Determination Process
Applied to the
Advanced Naval Gun System

Charles Michael Garverick
Commander, United States Navy
B.S., United States Naval Academy, 1959

The requirements determination process should lead to an optimum solution to meet a perceived mission deficiency. This thesis examines the process using a normative model of the System Life Cycle (which indicates what activities should be performed) and the Navy's prescriptive model (which specifies the activities that will be performed) to analyze the Conceptual Phase of the life cycle.

These models are compared with the descriptive evolution of the Advanced Naval Gun System during its conceptual development over the past seven years. Areas of differences are identified and recommendations offered to correct the problems which typically delay the orderly acquisition of new weapon systems.

Master of Science in
Management
March 1976

Advisor: Melvin B. Kline
Operations Research
and Administrative
Science Department

A Study of The Congressional Budget
and Impoundment Control Act of 1974: Realities
and Implications for the Department of Defense

Jonathan Hubert Gates
Lieutenant Commander, United States Navy
B.A., The Pennsylvania State University, 1963

and

Nelson Mack Prose
Commander, United States Navy
B.S., University of Illinois, 1958

This thesis analyzes the Congressional Budget and Impoundment Control Act of 1974 (Public Law 93-344). It provides historical background and describes in detail this new legislative budget procedure, its organizational structure and newly established instrumentalities - the House and Senate Budget Committees and the Congressional Budget Office.

Research was based upon extensive interviews with Congressional staff and Executive agency personnel. The investigation provides insights into operation of the new budget process and discusses the realities of the Act's reform provisions, problem areas and implications. Particular emphasis is given to those aspects which have potential impact for the Department of Defense (DOD) and the Navy, including budget preparation and Congressional interactions.

The major conclusions reached were that future DOD budget submissions will be analyzed in greater detail and will be considered in a changed and more competitive Congressional environment.

Master of Science in
Management
December 1975

Advisor: Edward J. Laurance
Department of Govern-
ment
Second Reader: Robert R. Judson
Department of Operations
Research

An Analysis of
the Management Information System for
U.S. Coast Guard Aircraft Pollution Patrols

Jerald Howard Heinz
Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1966

The purpose of this thesis is to examine the present data collected and to evaluate its usage in respect to pollution detection by Coast Guard aircraft patrols. It was found that, in general, more detailed and specific information is needed about the patrols. A system for collecting this new data and linking it to the present Pollution Incident Reporting System data base is proposed. The proposed system would allow evaluation of patrols at more specific areas and levels instead of the present district, coast and nationwide levels. Policy decisions could then be more specifically oriented to an area and/or the individual air station.

Master of Science
in Management
December 1975

Advisor: S. H. Parry
Department of Operations
Research and Administrative
Sciences

An Analysis of the Oakland Naval
Supply Center's Bay Area Local Delivery System

Edward Simon Hernandez, Jr.
Lieutenant Commander, Supply Corps, United States Navy
B.S., University of Southwestern Louisiana, 1961

and

Ronald James Gallitz
Lieutenant, Supply Corps, United States Navy
B.A., Carthage College, 1967

This document considers the physical distribution function as an area for potential cost savings and improved performance. In particular, the Bay Area Local Delivery (BALD) System of the Naval Supply Center (NSC), Oakland, California, was analyzed.

The current method of operation has been compared to a number of alternative approaches and each, in turn, has been analyzed with a view toward effecting a system that would accomplish the local delivery function in an equivalent or better manner for less cost.

Conclusions and recommendations have been made taking into account the assumptions developed, the research effort made, and the findings uncovered during the analysis.

Master of Science in
Management
June 1976

Advisor: R. W. Sagehorn
Operations Research
& Administrative
Sciences Dept.

The Naval Communications Processing and Routing System:
Analysis of an Automated System

Beth Marie Hintz
Lieutenant, United States Navy
B.S., University of Illinois, 1967

This thesis is designed to present a detailed description and analysis of the Naval Communications Processing and Routing System (NAVCOMPARS). Discussed are the objectives and principles of the Naval Telecommunications Automation Program (NTAP), with emphasis placed on delineating the shore components, particularly NAVCOMPARS. The capabilities of NAVCOMPARS are identified by describing the patterns of message flow through the automated system. Also considered are the manpower and training characteristics and the projected link with the Information Exchange Subsystem (IXS). A model of the central processing unit is presented in order to highlight the sequence of procedures employed by an automated message processing system. The underlying intent of this thesis is to provide a compact document which could be used as introductory material to acquaint non-computer specialists with the characteristics, requirements and potential of the Naval Communications Processing and Routing System.

Master of Science in
Management
March 1976

Co-Advisors: Sam H. Parry
N. F. Schneidewind
Operations Research
and Administrative
Sciences Department

A Validation of the Curriculum for Educating
Defense Systems Analysts at the
Naval Postgraduate School

James Vernon Hoekstra
Major, United States Marine Corps
B.S., Iowa State University, 1963

This thesis validates the Naval Postgraduate School (NPS) curriculum used to educate the potential Defense Systems Analyst (DSA) for the Marine Corps. The validation is accomplished in terms of the roles and functions which exist in the Marine Corps for the DSA. The DSA's role is investigated by first examining systems analysis: the discipline in which he is educated. Then the functions accomplished in each DSA billet (MOS 9652) are examined to provide a basis for determining the educational needs of the DSA. A profile is generated to clarify the DSA's role in the Marine Corps. Finally, the NPS curriculum is compared with a tested systems analysis curriculum used previously at the University of Rochester to validate the systems analysis portion of the NPS curriculum. The functional requirements on the DSA resulting from a billet analysis provide the basis for validation of the remainder of the NPS curriculum.

Master of Science in
Management
December 1975

Advisor: M. G. Sovereign
Dept. of Operations
Research and Administrative
Sciences

A SURVEY AND ANALYSIS OF THE USERS'
EVALUATION OF CONTRACT ADMINISTRATION
SERVICES

BY

Brian T. Hogan
Lieutenant Commander, Supply Corps, United States Navy
B. A., Yale University, 1962

and

Gary H. Monteith
Lieutenant Commander, Supply Corps, United States Navy
B. S., University of Tulsa, 1963

This research examined the development, administration and analysis of the results of a survey to measure the satisfaction of users with the contract administration services provided by both the Defense Contract Administration Services (DCAS) and the Plant Cognizance activities. The survey was the third part of an Office of the Assistant Secretary of Defense (Installations and Logistics) study effort.

Analysis of the data obtained yielded four conclusions: (a) the sample obtained was representative of the Department of Defense procurement workforce; (b) the responses to the overall evaluative questions were accurate reflections of responses to the individual functional questions; (c) the demographic characteristics of the respondents did not bias the evaluative responses and (d) of the four major areas of contract administration, only Engineering was statistically different for both DCAS and Plant Cognizance activities.

Some recommendations for further research and study are also provided.

Master of Science in
Management
June 1976

Advisor: E. A. Zabrycki
Operations Research
Administrative Sciences

A Field Experiment to Determine the Effectiveness
of a Circular Bracketing Sight at Low-Light Levels for
the M16A1 Service Rifle

Harold Lloyd Honbarrier
Major, United States Marine Corps
B.S., N. C. State University, 1965

A field experiment was conducted to determine the effectiveness of a circular bracketing sight in improving the hit capability of the M16A1 rifle at low-light levels at short range in quick-reaction situations. Eight riflemen fired at four pop-up targets that appeared for 2.5 seconds at ranges of 20 and 40 meters. The subjects used weapons fitted with the standard sight (control) and a circular bracket sight. Testing was conducted on the Live Fire Instrumented Range at Fort Hunter-Liggett, Ca., at a low-light level of 0.25 footcandles. Results showed that the bracket sight was 42% better than the standard sight over the entire experiment.

Master of Science in
Management
June 1976

Advisor: James K. Arima
Department of Operations
Research and
Administrative Sciences

The Horizontally Polarized Dipole Antenna
As a Solution to the Problems of
High Frequency Short Range Communications

Robert Allison Hopper
Lieutenant Commander, United States Navy
B.A., The King's College, 1960

The purpose of this paper is to examine the problem of short range communications, in particular, communications within the area of the high frequency band commonly known as the skip zone or silent area and to determine the feasibility and extent to which a horizontally polarized antenna could be used to alleviate these problems. A documentation of the problems of short range communications as they affect U. S. Naval operations will be made, including ship to shore, shore to ship, and ship to ship communications. Current methods of communicating within this region will be examined, and a study of the cost effectiveness of the solution will be made to determine if the solution is in fact worth the investment.

Master of Science in
Management
March 1976

Advisor: O. M. Baycura
Electrical Engineering
Department

Naval Reserve Telecommunication Program:
Adequacy and Employment

Ronald William Hull
Lieutenant Commander, United States Naval Reserve
B.B.Ad., Gonzaga University, 1961

The Naval Reserve has recently been restructured to meet the criteria of the Total Force Policy. Part of that restructuring established a Reserve Telecommunication Program which supports Commander, Naval Telecommunication Command, in his mobilization requirements. Unless the program is more carefully monitored and funded, the Reserve Telecommunication Program will not be able to provide the properly trained personnel to the communication community as required. In this respect various training alternatives have been investigated and compared on the basis of their relative cost to the effectiveness of their training value. From this qualitative assessment of the alternatives, a format of training may be selected to meet COMNAVTELCOMM readiness requirements for reserve telecommunication personnel.

Master of Science
in Management
March 1976

Advisor: P. M. Carrick
Operations Research
& Administrative
Sciences Department

The Impact of Inflation on Profit
as Determined by Contractual Provisions
of Naval FPIF Shipbuilding Contracts

Terry Alan Ippel
Lieutenant, United States Navy
B.S., Calvin College, 1965
B.S. E., University of Michigan, 1967
M.S. ADM., George Washington University, 1973

The contractual provisions contained in Naval FPIF Shipbuilding Contracts determine to a large extent the impact of inflation on contract profitability. The concern of shipbuilders regarding the inflationary erosion of profitability is due in part to the long-term nature of shipbuilding contracts.

An analysis is made of the payments and escalation provisions contained in fourteen major shipbuilding contracts signed over a span of eight years. Profit profiles for seven of these shipbuilding contracts are generated based upon six payment thresholds. The profit profiles, when expressed in terms of deflated dollars, present value at 15% and present value of deflated dollars at 15% show a declining trend in profitability.

Three separate approaches for providing escalation coverage for profit are discussed. It is recommended that one of these approaches be implemented in future shipbuilding contracts.

Master of Science in
Management
March 1976

Advisor: Michael G. Sovereign
Operations Research and
Administrative Sciences
Department

A PROGRAMME FOR THE TAILORED SELECTION OF RESPONSE PATTERNS

By

Jeffrey Quentin Jackson
Lieutenant Commander, Canadian Forces
(Bachelor of Science (Engineering Physics))

The use of computer techniques to evaluate data in an attempt to find useful predictors of various criteria is of continuing interest. The use of stepwise pattern analysis to select predictors has shown promising results. This paper presents a refinement of this technique called TPAN, which allows the items selected to be "tailored" to the various patterns of the previously selected items. This is followed by a discussion of the results obtained using TPAN to select a four-item pattern, from the responses to an advancement examination, that best predicts performance on the general classification test.

Master of Science in
Management
June 1976

Advisor: Ronald A. Weitzman
Department of Operations
Research and Administrative
Sciences

Developing Mathematical Models
for Preliminary Internal Control Evaluations
of Inventory Systems in Auditing

Man-Won JEE
Major, Republic of Korea Army
B.S., Korea Military Academy, 1966

In an article entitled "Internal Control Evaluation: How The Computer Can Help" David C. Burns and James K. Loebbecke presented a computer simulation audit approach for evaluating internal control. In their article Burns and Loebbecke applied their simulation approach to evaluate an illustrative manufacturing inventory internal control system. This thesis presents two alternative mathematical approaches for solving the Burns/Loebbecke inventory problem: The two mathematical approaches presented are compared and the unique conditions necessary for the application of each approach are discussed.

Master of Science in
Management
December 1975

Advisors: David C. Burns
Russ Richards
Department of Operations Research
and Administrative Sciences

Facsimile Communication in the Fleet Marine Force
A
"Third Dimension" in Tactical Communications

Kenneth Donald Johnson
Major, U.S. Marine Corps
B.S., Carroll College, 1961

This paper introduces the reader to facsimile communication by defining in simple terms the general modus operandi of facsimile communication and then comparing the capabilities of record (teletypewriter) communication with facsimile communication. The present Department of Defense (DOD) communication system is predominantly a "two dimensional" system consisting of voice and alpha-numeric/special character record communications. The thesis discusses the inherent advantages of facsimile communication along with the limitations of analog facsimile technology. The requirement for facsimile communication in the Marine Corps is discussed, noting that there is a requirement for this "third dimension" in tactical communications. A detailed discussion of recent digital facsimile technology is provided delineating the advantages of digital facsimile technology over existing analog facsimile equipment. Alternative facsimile applications in the Fleet Marine Force are outlined and a broad concept of digital facsimile employment is proposed. Conclusions based on the overall discussion are drawn, and recommendations in the form of steps that the Marine Corps should take toward implementation of a tactical digital facsimile system are provided.

Master of Science in
Management
September 1975

Advisor: Paul E. Cooper
R. E. Jamison

The A-7 ALOFT Cost Model:
A Study of High Technology Cost Estimating

Ronald Lloyd Johnson
Commander, United States Navy
M.S., U.S. Naval Postgraduate School, 1967

and

Earle William Knobloch
Lieutenant, United States Navy
B.S., Purdue University, 1967

This analytical study contains the development of an appropriate life cycle cost (LCC) model for the A-7 Airborne Light Optical Fiber Technology (ALOFT) system as defined in the Naval Electronics Laboratory Center Technical Document 435. The model was developed to support an A-7 ALOFT economic analysis which will compare the total systems costs and performance benefits of an A-7 fiber optic linked navigation and weapons delivery system to existing or proposed wire interconnect designs. Major features of this study include the development of: (1) a process to derive cost estimates of a high technological development in the early conceptual stage, (2) an appropriate LCC model for the A-7 ALOFT economic analysis, and (3) fiber optic costing methodology to support the LCC analysis. This analysis is a follow-on study to "An Approach to the Estimation of Life Cycle Costs of a Fiber Optic Application In Military Aircraft" by J. M. McGrath and K. R. Michna which is recommended reading for background information essential to this study.

Master of Science in
Management
December 1975

Advisor: C. R. Jones
Operations Research &
Administrative Sciences
Department

Public Works Department Maintenance Management
Information System

Wayne Edward Johnson
Lieutenant Commander, Civil Engineer Corps, United States Navy
B.S.C.E., University of Minnesota, 1960

and

Hilbert Dwayne Dean
Lieutenant Commander, Civil Engineer Corps, United States Navy
B.S.C.E., University of Arkansas, 1966

This thesis reviews the facilities maintenance management program as applied to naval shore activities, to assess and determine what maintenance management information is needed and provided at the Public Works Officer's level of management. The organizational hierarchy of the U.S. Navy, which serves as the budget path for the Operation and Maintenance, Navy (O&MN) appropriation is related to the hierarchies of management responsibilities and information systems. The authors conclude that the Public Works Officer is primarily an operational manager, that he needs to be able to evaluate and analyze achievements in relation to stated objectives, and that the existing annual maintenance plan is deficient. The concept of the Budgeted Maintenance Plan (BUMP) is recommended to provide the means for evaluation on an annual basis and to provide a microeconomic tool to transform objectives into an efficient operating plan and budget.

Master of Science in
Management
June 1976

Advisor: CDR John C. Totten
Operations Research
& Administrative
Sciences Department

A Comparison Between Actual Parts Usage
And Parts Usage Projected in Allowance Parts
Lists for Forklift Vehicles

Robert Richard Jordan
Lieutenant Commander, United States Navy
B.A., Duke University, 1965

This research effort involves a comparison between the actual repair parts demand data generated by the forklifts at Naval Supply Center, Oakland, California, during calendar year 1975 and the allowance quantities of the applicable allowance parts lists (APL's). The comparison is accomplished from three perspectives: the first perspective evaluates the degree of correlation between line items demanded and the line items appearing in the APL's; the second perspective provides a projection of the effect of increased forklift operating hours on the quantities demanded among those demands for line items allowed by the APL's; and the third perspective identifies those line items for which demand generated rendered the quantities demanded significantly different from the quantities allowed by the APL's. As a result of these comparisons and the low correlation between demand data and allowance projections, it is hypothesized that the crucial variable contributing to this low correlation is the low utilization of the equipments in terms of annual operating hours. The conclusion reached is that APL's for forklifts, as presently formulated, are a support planning document of dubious value in situations of low equipment utilization such as observed in this study.

Master of Science in
Management
June 1976

Advisor: A. C. Crosby
Operations Research
& Administrative
Sciences Department

An Evaluation of Incentivized Contractor Logistic Support
Plans to Enable Full Phased Provisioning: The Trident Fire
Control System Logistic Support Case

178

Charles R. Kiger
Lieutenant Commander, Supply Corps, United States Navy
B.S., United States Naval Academy, 1960
M.S., George Washington University, 1972

William E. Grove
Lieutenant Commander (Sel), Supply Corps, United States Navy
B.S., Syracuse University, 1967

Maurice D. Hanson
Lieutenant Commander, Supply Corps, United States Navy
B.A., Minot State College, 1965

This thesis contains an analysis of the application of phased provisioning/contractor logistic support to the Trident fire control system acquisition. The Fire Control and Guidance Branch (SP-23) of the Navy Strategic Systems Project Office (SSPO) is the first of SSPO's technical branches to incorporate such a plan into an acquisition contract. Because this concept has potential for improving the cost-effectiveness of logistic support for new weapons systems, this study was undertaken to provide an analysis of the specific contract incentive structure. Details of the support plan are explained and the contract is evaluated using an extension of the approach used by VITRO Laboratories in a pre-negotiation study. An illustration is presented of contract multiple incentive fee package formulation utilizing the POESMIC programs. Recommendations are made for improvement of subsequent fire control contracts.

Master of Science in
Management
June 1976

Advisor: Carl R. Jones
OR/AS Department

Co-Advisor: LT John Finnerty
Mathematics Department

A Full Cost Allocation Study
of the Naval Postgraduate School

Kenneth Charles Kreutter
Lieutenant, United States Coast Guard
B. S., United States Coast Guard Academy, 1970

Robert John Williamson, Jr.
Lieutenant, United States Coast Guard
B. S., United States Coast Guard Academy, 1970

The organization of the Naval Postgraduate School is analyzed and the final service outputs of the School provided to external users are identified and established as final cost objectives. Expenditures directly and indirectly associated with the final service outputs are segregated. Directly associated expenditures are attached to the appropriate final service outputs and indirectly associated expenditures are grouped into cost pools. The cost pools are allocated to the final service outputs to provide a full reallocation of the Naval Postgraduate School's total expenditure for fiscal year 1974. Using the results of the reallocation, an average annual cost per student is obtained. Finally, the reallocation is adapted to the specific requirements of the Defense Resources Management Education Center.

Master of Science in
Management
December 1975

Advisor: David C. Burns
Operations Research and
Administrative Sciences
Department

The Ship Acquisition Process:
An Interorganizational Perspective

Hayden Louis Leon, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1959

The ship acquisition process consists of the development and production of a ship and its systems by organizations bound into a structure by existing laws, regulations, and practices. One of the major determinants of efficiency and effectiveness of this process is the correlation of the structure with the tasks associated with acquisition of the ship. Real and/or perceived problems are indicated in the process by adverse publicity and management actions. The thesis contains a review of organizational theory relating structure, tasks, conduct and performance. The structure and tasks associated with ship acquisition are examined and an example is provided from the Patrol Frigate design showing the relationship of structure and tasks.

The author concludes the ship acquisition structure is not theoretically well matched at a point in time with the tasks it is required to perform and a coordinated longitudinal investigation of the weapons acquisition process is needed. A framework for this investigation is suggested.

Master of Science in
Management
March, 1976

Advisor: C.R. Jones
Operations Research
and Administrative
Sciences Department

AN ANALYSIS OF
UNPLANNED REQUIREMENTS AND THEIR
IMPACT ON THE NAVAL ELECTRONIC SYSTEMS COMMAND

by

Justin Daniel McCarthy^a
Lieutenant, Supply Corps, United States Navy
B.S., Oakland University, 1969

John Thomas Quinn^a
Lieutenant Commander, Supply Corps, United States Navy
B.S., U.S. Naval Academy, 1962

and

William Byrd James^b
Lieutenant Commander, Supply Corps, United States Navy
B.A., University of Mississippi, 1965

The Naval Electronics Systems Command (NAVELEX), as one of the Navy's Hardware Systems Commands, is vitally concerned with its ability to supply the fleet needed equipments when failures occur. Their ability to accomplish this goal is currently restricted by Navy policy which prohibits the funding of unplanned requirements for principal end item equipments. As a partial solution to this problem, NAVELEX has developed alternate sources of material, but it now feels these sources are disappearing. As a result, NAVELEX's current objective is to develop the means to substantiate funding support for principal end items. This analysis examines NAVELEX's current ability to meet this objective and identifies areas in which effective action must be taken before funding substantiation will be possible.

^a Master of Science in
Management
June 1976

^b Master of Science in
Operations Research
March 1976

Advisor: F. R. Richards
Operations Research and
Administrative Sciences

An Approach to the Estimation of Life Cycle
Costs of a Fiber-Optic Application in Military Aircraft

John Michael McGrath
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1962

Kenneth Ralph Michna
Lieutenant Commander, United States Navy
A.B., Wabash College, 1965

As significant technological advances in fiber optics and optical data transmission methods are being made, it is necessary to develop appropriate methods for estimating life cycle costs for alternative coaxial/twisted pair wire and optical fiber avionics. Measures of effectiveness are suggested for each alternative system. An approach, which structures the technological and demand uncertainties of fiber optics, is developed through scenarios as a means of relating cost and effectiveness. It is suggested that Delphi and experience curve techniques be used in conjunction with ordered scenarios as a technological forecasting technique for estimation of life cycle costs of fiber optics. In addition, a review of the historical and technological background of fiber optics and their application to the Naval Electronics Laboratory Center (NELC) A-7 Airborne Light Optical Fiber Technology (ALOFT) Program is included.

Master of Science in
Management
Operations Research
September 1975

Advisor: Carl R. Jones
Operations Research
and Administrative
Sciences Department

A Systems Analysis of the Naval
Environmental Data Network (NEDN)

Stuart Anderson Merriken
Commander, United States Navy
B.S., U.S. Naval Academy, 1958

This thesis is a study of the Naval Environmental Data Network (NEDN). The objective of the thesis is to conduct a system analysis of the NEDN to establish a basis for designing or redesigning a better, more cost effective network. Emphasis is placed on communication costs. The study is in two parts. The first part describes the existing system, the Naval Intelligence Data Network (NIDN) which affects the NEDN, the proposed NEDN/NIDN communication terminal, and other networks which are used for comparative purposes. The second part analyzes the NEDN to establish ways to improve the system. The overall conclusion is that cost effective improvements can be made, in particular, reduction of line communication costs. Specific recommendations for improvements are offered.

Master of Science in
Management
September 1975

Advisor: O.M. Baycura
Department of
Electrical Eng.
Co-Advisor: J.W. Creighton
Department of
Operations Research/
Admin Sciences

The Human Resource Management Program
and
Shipboard Habitability Considerations

Lonzo Oliver Milam
Lieutenant Commander, United States Navy
B.A., Naval Postgraduate School, 1974

The Navy's current Human Resource Management Program got its impetus from social change that occurred in the United States during the late nineteen sixties, and from the expected impact upon the Navy of the all-volunteer military force concept. The primary goals of the program have evolved into simultaneously integrating men and mission and meeting the human needs of Navy personnel. The method of accomplishing these goals is through the use of survey-guided organizational development. The Human Resource Management Survey is the primary instrument in the development effort for identifying and diagnosing problems of organizational functioning. However, the survey contains no questions useful in identifying or diagnosing the effect of habitability problems aboard Navy ships. It is the contention of this paper that the habitability of Navy ships can have a moderating effect on Navy personnel's perceptions of their command and its level of functioning and therefore should be addressed by the Human Resource Management Program and its survey instrument.

Master of Science in
Management
March 1976

Advisor: W. J. Haga
Operations Research
and Administrative
Sciences Department

A Factor Analysis of the Behavioral Dimensions
of
Marine Corps Performance Evaluation

Charles Allen Millard
Captain, United States Marine Corps
B.A., Vanderbilt University, 1968

This study consists of a factor analysis of the behavioral dimensions of the current Marine Corps Performance Evaluation System, using randomly selected fitness reports for officers in the grades Second Lieutenant through Colonel. The objectives and uses of performance evaluation, both in the Marine Corps and in general, are discussed and the factor analysis methodology is developed. The fitness report data is then analyzed, leading to an identification of three underlying factors common to all behavioral dimensions. The nature and composition of these factors is then discussed. Finally, it is concluded that the Marine Corps Fitness Report could be effectively simplified by using the three common factors rather than the 22 dimensions in current use.

Master of Science in
Management
March 1976

Advisor: Ronald A. Weitzman
Department of Operations
Research and Administrative
Sciences

Computer-Assisted Detailing
for
U.S. Naval Officers

William Brooks Blaisdell Moody
Lieutenant Commander, United States Navy
B.A., Wesleyan University, 1959

The author, a former Naval officer detailee, explains and discusses officer assignment and distribution practices in the Bureau of Naval Personnel including computer support to the current manual officer assignment/distribution system. He reviews recent literature relating to computer-assisted assignment of personnel within the interpretive framework of approaches used. He next discusses the computer-assisted detailing system proposed for implementation in the Officer Development and Distribution Division of the Bureau of Naval Personnel under the Future MAPMIS project. In a concluding chapter, approaches to the use of computers in the assignment of Naval officers, particularly in the Future MAPMIS project, are analyzed. The author concludes that the approach to computer-assisted assignment taken by Future MAPMIS is appropriate, but offers suggestions and recommendations for the actual implementation of the project in the area of officer assignments.

Master of Science in
Management

June 1976

Advisor: C.P. Gifford
Operations Research
Department

The Indoctrination Division: A Model for Effective
Integration of First-Term Enlisted Personnel
into the Aircraft Carrier Organization

David Paul Mozgala
Lieutenant, United States Navy
B.S., United States Merchant Marine Academy, 1968

This paper proposes an Indoctrination division model for processing of first-term enlisted personnel reporting aboard aircraft carriers. The model is designed to meet the needs of these individuals as adolescents as well as sailors.

Theories of adolescence, problems of modern youth and attitudes of first-term sailors are examined in order to determine the needs of the client population, and explore ways of meeting these needs.

Finally, a specific Indoctrination model is offered which is based on the theories discussed and the author's experience as an I-division officer aboard an aircraft carrier.

Master of Science in
Management
June 1976

Advisor: CAPT G. B. Allen
Department of
Operations Research
& Admin Sciences

A Study of Twice Failed Select for Promotion of Lieutenants
in the United States Navy and its Cognitive Impact on Cost Savings

Jose Terlaje Nededog
Lieutenant, United States Navy
B.A., University of Maryland, 1972

The purpose of this thesis is two-fold:

1. It seeks to investigate the current statutes, regulations, instructions, and policies regarding the involuntary separation of officers resulting from failure to be selected for promotion to lieutenant commander.

2. It attempts to estimate a lower limit of real costs associated with each officer separation of this type.

It is the author's hope that conclusions drawn from the data presented can be used by the Navy to more accurately evaluate whether it is more beneficial to the Navy to separate twice failed select officers or to retain them on active duty.

Master of Science in
Management
December 1975

Advisor: John W. Creighton, Ph.D.
Operations Research and
Administrative Sciences
Department

A Performance Measurement System
for the
Aircraft Intermediate Maintenance Department Officer

Irvin Leon Olden
Lieutenant Commander, United States Navy
B.S., University of Missouri, 1965
M.S., University of Missouri, 1966

A survey of management control systems presently being employed in the Aircraft Intermediate Maintenance Departments of the U. S. Navy is presented in this thesis and a new standard performance measurement system is recommended based on an analysis of the existing management control concepts. The recommended standard performance measurement system is developed by first defining key result areas for an Aircraft Intermediate Maintenance Department and then constructing measurement indices within each area. This new system incorporates several Navy programs which heretofore have been implemented only on an individual basis.

Master of Science in
Management
June 1976

Advisor: C. P. Gibfried
OR/AS Department

Analysis of the Naval Supply Corps Newsletter
As a Means of Information Transfer

George Dedrick Outlaw, Jr.
Lieutenant Commander, United States Navy
B.S., Auburn University, 1964

The purpose of this study was to evaluate the Naval Supply Corps Newsletter as a medium of information transfer.

A questionnaire was developed and distributed to two thousand recipients of the Newsletter. Eight hundred and nine responses were received.

The data were analyzed using the computer program "Statistical Package for the Social Sciences." The results and analyses are presented.

Master of Science in
Management
September 1975

Thesis Advisor: J.W. Creighton
Operations Research and
Administrative Sciences
Department

A Survey of Matched Filter and
Correlation Devices with an Evaluation
of Two Digital Correlators

Joseph Albert Poliakov, Jr.
Lieutenant, United States Navy
B.E.E.E., Vanderbilt University, 1969

A survey of matched filter and correlation devices was made covering LSI, CTD, SAW, and Optical devices. Their important characteristics were summarized.

The role of matched filters and correlators in spread spectrum communication techniques was covered along with the related theory.

A digital correlator device evaluation testing scheme was formulated to measure the logic thresholds, bias tolerances, power consumption, output linearity, correlation transient characteristics and maximum shift-register rate of different digital correlators using the same basic testing apparatus. A 64-bit EFL/3D digital correlator and a 32-bit CMOS/SOS digital correlator were tested using this testing scheme. The results showed that this testing procedure could be used to obtain evaluation parameters which could be used to compare digital correlators that were fabricated using different technologies.

Master of Science in
Management
September 1975

Advisor: Tien-Fan Tao
Electrical Engineering
Department

A Model to Diagnose Learning Obstacles
and to Facilitate the Adoption of the
SI Metric System within Organizations

Nguyen Ngoc Quynh

B.S., French Naval Academy, 1955

LL.B., University of Saigon, V.N., 1971

and

Dang Diem

LL.B., University of Saigon, V.N., 1972

Since the recommendation of the Department of Commerce in 1968 that the United States embark on a national program for conversion to the metric system, no effective or significant action has been taken by the Congress or any other organization to promote the metric conversion. Apparently no method or procedure has been developed to identify and overcome learning obstacles or organizational lag in the metric changeover.

Based on surveys conducted by the authors in four organizations, in education and in the business sector, and in the light of recent theories of learning and innovation, this study formulated a model to diagnose learning obstacles and to accelerate the adoption of the metric system within organizations. Data from these surveys were used to predict ideal change agents and propose a strategy for incorporating specific levels of learning in the organizational adoption of this innovation.

Master of Science in
Management
December 1975

Thesis Advisor: R.A. McGonigal
Operations Research and
Administrative Sciences
Department

Structure, Conduct, and Performance
of the United States Aerospace Industry

by

Wendell Clayton Ridder
Commander, United States Navy
M.S., Naval Postgraduate School, 1966
B.S., University of Kansas, 1960

Michael Kasper Heinz
Lieutenant Commander, United States Navy
B.S., Kansas State University, 1961

Structure, conduct and performance are important elements in the economic analysis of an industry. This thesis identifies and analyzes the sub-elements of structure, conduct, and performance of the United States aerospace industry and discusses how these sub-elements interact. Structure sub-elements are comprised of organizational structure, concentration ratio, product differentiation, barriers to entry, demand, and buyer concentration. Conduct sub-elements consist of effects of buyer concentration, product strategy, pricing behavior, research and development, competition, labor utilization, financial strategies, and merger and diversification. Performance sub-elements are identified as financial performance, effects of industry concentration on performance, Government assistance/relief to ensure continued performance by major aerospace companies, alternatives for satisfying Government demand when the number of industry suppliers is limited, and performance incentives relative to industry capacity and DOD mobilization demands. A brief history of the industry to 1965 precedes the analysis and policy recommendations.

Master of Science in
Management
March 1976

Advisor: C. R. Jones
Operations Research and
Administrative Sciences
Department

The Development of a Personalized System of Instruction (PSI)
for Pre-calculus Mathematics (MA 1021)

Robert N. Ross
Lieutenant Commander, United States Coast Guard
B.S., University of Florida, 1961
M.Ed., Florida Atlantic University, 1971

There is a vast opportunity to apply the Personalized System of Instruction technique within the military atmosphere, and especially at the Naval Postgraduate School where the emphasis is on graduate education. The subject of this thesis is to explore the Personalized System of Instruction method and to develop a pre-calculus course using this method for use at the Naval Postgraduate School.

Master of Science in
Management
December 1975

Advisor: John D. Finnerty
Department of
Mathematics

Promotion Patterns and Trends as Related to
Duty Station Assignment

Larry Curtis Selgelid
Commander, Supply Corps, United States Navy
B.A., Morningside College, 1959

William Kurtz Perry, Jr.
Lieutenant Commander, Supply Corps, United States Navy
B.B.A., The University of Texas, 1967

Numerous factors impact on a Navy officer's selection or fail-selection to the next higher pay grade. This thesis examines an officer's duty station assignment at the time he is eligible for promotion to Captain or Commander in the Supply Corps in an attempt to determine the relationship which exists between specific duty stations or types of activities and promotion opportunity. Trend analysis is performed over the nine year data base (Fiscal Years 1968 through 1976) to determine promotion opportunities over time for selected groups of duty stations.

The thesis is mainly concerned with the duty stations of officers in the primary promotion zone, but also examines the duty station relationships of Supply Corps Officers selected from above and below the primary promotion zone.

Master of Science in
Management
June 1976

Advisor: Charles P. Gibfried
CDR, SC, USN
Operations Research
and Admin. Science
Department

T-56 Turboprop Engine Overhaul Alternatives
For The Indonesian Air Force

Setyo Siswanto
Captain, Indonesian Air Force
M.S., Anthonin Zapotocky Military Academy
Brno Czechoslovakia 1969

The Indonesian Air Force currently maintains and overhauls its aircraft structures and piston engines. However, turbo-prop and jet engines are shipped overseas for overhaul. Under this policy a large number of spare engines are needed due to long turn-around times. In addition, the costs of overseas overhaul appear to be higher than they would be if the overhaul was done in Indonesia. Finally, overseas overhaul compromises Indonesia's independence. This report studies the feasibility of overhaul of the T-56 turboprop engine within-the-country and presents a preliminary estimation of the costs for setting up overhaul capabilities for that engine. A cost comparison is then made between within-the-country overhaul and overseas overhaul. Based on this comparison, the within-the-country alternative appears to be the most economical. Refinement of the cost analysis is needed and, in addition, because of economics of scale the establishment of overhaul capabilities for all military jet engines in Indonesia should probably be considered before any decisions are made to establish any overhaul capability.

Master of Science in
Management

March 1976

Advisor: Alan W. McMasters
OR/AS Department

Contract Employment--What are the Alternatives?

Phillip James Spence
Captain, Royal Australian Army Ordnance Corp
B. Comm., University of Melbourne, 1972

Military contractual employment is viewed from two aspects. Firstly, attitudes, survey results, and previous studies are examined to determine individual attitudes to contractual terms. Secondly, models of contractual terms are examined to determine effectiveness matched against cost. The study also acknowledges other elements that affect contractual employment, such as vocational choice, legal environment and social norms prevailing. The study concluded that although there are strong arguments for reducing or eliminating contracts (for enlistment/reenlistment incentives), the necessity to recoup training and equipping costs remains an overriding consideration. To this end a minimum term of initial enlistment remains necessary.

Master of Science in
Management
December 1975

Advisor: J. K. Arima
Operations Research
and Administrative
Sciences Department

Data Distribution for Tactical
Data Systems (U)

Bernard Tom Stickler
Lieutenant Commander, United States Navy
B.A., University of New Mexico, 1965

Phillip M. Balisle
Lieutenant, United States Navy
B.S., Oklahoma State University, 1970

This thesis presents a simulation model of an NTDS Link-11 net operating in parallel with an NTDS Special System net presently under development by Naval Electronics Laboratory, San Diego. The model was constructed in order that designers might better analyze how the two systems should be married. In this regard, the model is especially directed at combinations which have the possibility of reducing net cycle times for command control messages. Considerable attention was applied to the potentials of data distribution between the two links.

The model also offers the flexibility of studying the impact various equipment modifications might have on Link-11 as well as the system as a whole. This may be achieved by using a "black box" concept to represent equipments in terms of operation times.

Messages used with the model are constructed and processed in accordance with Model IV NTDS software requirements. The model was exercised under a wide range of scenarios. Statistics obtained are intended to serve the two fold purpose of validating the model and revealing potential areas for parallel link analyses.

Master of Science in
Management
September 1975

Advisors: Paul R. Milch
Sam H. Parry
Operations Research and
Administrative Sciences
Department

Developing A Measure
of
Marine Corps Recruiting Effectiveness

Robert J. Sullivan
Major, United States Marine Corps
B.S., United States Naval Academy, 1965

This study analyzed the Fiscal Year 1975 Marine Corps enlistment productivity and recruiting effort in the State of California. Twelve variables describing the public high schools in California were used to predict enlistment productivity and recruiting effort.

It was determined that productivity could be predicted on the basis of recruiting effort alone. This meant that the recruiting substations in this study, on the average, achieved their productivity goals. Recruiting effort was found to be applied, on the basis of male minority students enrolled in vocational education programs and in school districts that had a high percentage of their income from local sources.

A measure of recruiting effectiveness was proposed. The model developed in the study gave a predicted productivity figure for a cross-validation sample of thirteen recruiting substations. The actual productivity of each substation was compared to the predicted value. This ratio was used as the measure of effectiveness.

Master of Science in
Management
June 1976

Advisor: James K. Arima
Department of Operations
Research and Administrative
Science

A Comparative Study of the Navy Project Manager and
His Civilian Counterpart in Industry

Peter William Sushka, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1962

An effective interface and working relationship between the Navy project manager and his industrial counterpart is essential. The Navy project manager and the civilian project manager accomplish basically the same job but do so in different environments, with different experience, and under dissimilar incentive systems. This comparative study of the two project manager types involves a functional analysis of the many different "environmental/experience/incentive" factors that result in different values, behavior and performance.

The purpose in examining these factors is to identify those contextual considerations that contribute to healthy organizations and to improved project performance. Those factors that benefit one type of project manager are examined to determine the extent to which they exist and might be mutually applicable to that manager's counterpart.

Data is collected through the structured interview with Navy project managers and their civilian counterparts in industry.

Recommendations for modifying particular contextual factors are made to benefit project performance and reduce project manager conflict.

Master of Science in
Management
March 1976

Advisor: Carson K. Eoyang
Operations Research and
Administrative Sciences
Department

Management Through
Accountability

Mahmoud Torabi
Lieutenant, Imperial Iranian Navy
B.S., Dartmouth College, England, 1969

This thesis examines accountability as it relates to the manager's job. It relates accountability to various management theories and to the many elements which cause members of an organization to be accountable.

The thesis credits "Management by Objectives" for much of the background of "Management Through Accountability", but advances the premise that accountability toward reaching objectives is the foundation upon which all management systems are built.

Master of Science in
Management
December 1975

Advisor: Professor J. W. Creighton

Department of Operations Research
and Administrative Sciences

An Analysis of National Health Planning
and Resource Development Act of 1974
and Its Impact on Health Care Delivery

William Clare Truesdell, Jr.
Lieutenant Commander, United States Navy
B.B.A., University of Oklahoma, 1966

Marshall Sol Duny
Lieutenant, Medical Service Corps
United States Navy
B.S., The George Washington University, 1973

This thesis examines the National Health Planning and Resource Development Act of 1974 (1974 Act). Some of the previous major Federal legislation in health planning and resource development are summarized. Problems created due to the previous legislation are discussed. Reasons given by Congress for the passage of the 1974 Act are investigated in depth. Descriptions of the organizational components, their functions, duties and responsibilities are given. Possible impacts upon the civilian and military health care delivery systems are suggested.

Master of Science in
Management
June 1976

Advisor: David Whipple
Operations Research
and Administrative
Sciences Department

Application of Container Technology
to
United States Marine Corps
Tactical Electric Generator Systems

John S. Walker
Major, United States Marine Corps
B.M.E., Rensselaer Polytechnic Institute, 1963

The study focuses on containerization of a particular class of cargo--Marine Corps mobile electric generators. Containers are considered as the transportation medium for generators in both trailer-mounted and skid-mounted configurations. Shelters compatible with container handling systems are evaluated for use in generator operation as well as transportation. Generators which are candidates for shelterization are identified by size and unit.

Master of Science in
Management
June 1976

Advisor: John C. Totten
Department of Operations
Research and Administrative Sciences

Analysis of the Perceived Reward to the Receiver
and its Impact on the Predictive Model of Technology Transfer

James Hill Welborn
Lieutenant Commander, Supply Corps, United States Navy
B.A., Furman University, 1960

Keith Eugene Nyenhuis
Lieutenant Commander, Supply Corps, United States Navy
B.A., Calvin College, 1961

It was hypothesized that rewards, as perceived by an individual in an organization, are important in that perceived reward forms one identifiable factor in attempting to predict the rate of movement of ideas within an organization. Various concepts and models are discussed relating to this hypothesis. The methodology to determine the influence of the perceived reward and its subsequent impact on the flow of ideas within an organization was formed into a measuring instrument. The results from the situational interviewing instrument are presented and conclusions support the hypothesis that perceived reward is a vital factor in predicting idea flow.

Master of Science
in Management
June 1976

Advisors: J. A. Jolly
J. W. Creighton
Department of Operations
Research & Administrative
Sciences

The Preparations For
And The Implications of
The General World Administrative
Radio Conference of 1979

Martha Jane Wheaton
Lieutenant, United States Navy
B.A., University of Maine, 1969

In 1979 the International Telecommunication Union (ITU), one of the oldest and most specialized agencies of the United Nations, will convene an Administrative Conference to review and revise, as necessary, the Radio Regulations in their entirety. This is the first time since 1959 that a GARC will have been empowered to treat the Radio Regulations as a whole. With the world's radio telecommunications expanding by quantum leaps, the competition for frequency allocations can be expected to be fierce. To make matters worse, ITU, like the United Nations, is a "one nation, one vote" forum. Many countries, mostly the lesser developed ones of the Third Bloc, have started using their votes for political gains during the last few conferences.

This thesis proposes to outline the trends seen arising from the last few WARCS in an effort to predict what problems the United States is apt to face in 1979. It also outlines the preparations presently under way within the United States for this conference and presents recommendations toward the direction it feels these preparations must go for a favorable outcome in the 1979 negotiations.

Master of Science
in Management
September 1975

Advisor: O. M. Baycura
Department of Electrical
Engineering

The Navy Industrial Fund

Edwin Richard Wicklander, Jr.
Lieutenant, United States Navy
B. S. E. E., Purdue University, 1968
M. S. E. E., Naval Postgraduate School, 1975

The Navy Industrial Fund is a revolving fund used to provide working capital for industrial-commercial type activities in the Department of the Navy. The first NIF activity was the Defense Printing Service which was converted to NIF operations on 1 November 1949. At the present time there are 84 NIF activities.

The author researched the background, management, and operation of the fund activities. The following questions are encompassed in this thesis: How did the NIF originate? Why did it come into existence? How is it managed? How well does it work?

In conclusion, the strengths of the NIF as well as continuing problems are discussed.

Master of Science in
Management
March 1976

Advisor: Leslie Darbyshire
Dept. of Administrative Sciences

Public Relations Effect
On Organization Performance:
The U. S. Coast Guard

James Frederick VerPlanck
Lieutenant, United States Coast Guard
B. S., United States Coast Guard Academy, 1967

United States Coast Guard archival data covering two years was analyzed to determine if public relations efforts were affecting Coast Guard organization output. Quantitative measures of organization output and public relations effort were formulated. Public relations scores were combined to form an independent variable. Organization output, as measured by operational activity, was scored and combined to form a single dependent variable. Bivariate correlation analysis was conducted on several causal time-lag data configurations. Public relations efforts were found to have no consistent significant effect upon measures of USCG organization output. A subset of USCG outputs, intuitively selected for sensitivity to public relations efforts, also showed no consistent pattern of correlation with levels of public relations effort.

Master of Science in
Management
December 1975

Advisor: William J. Haga
OR/AS Department

IRREDUCIBILITY OVER THE RATIONALS

Edward Cass Traasdahl
Captain, United States Marine Corps
B.A., University of California at Long Beach, 1967

A brief historical survey indicates the type of general irreducibility criteria that are sufficient for irreducibility over the rationals. Three general approaches to the problem are then examined in turn. The first of these involves an application of ideal theory for number fields, the second a construction of Newton polygons for which an appropriate multiplication theorem holds and the last a method for constructing non-Archimedean values on the field of fractions of the ring of polynomials over the rationals from which irreducibility criteria can be deduced.

The conclusion summarizes the nature of these attempts.

Master of Science in
Mathematics
September, 1975

Advisor: Daniel L. Davis
Mathematics
Department

Investigation of Gravitational Effects
on a Variable Conductance Heat Pipe
Utilizing Liquid Crystal Thermography

William Henry Batts, Jr.
Commander, United States Navy
B.S., United States Naval Academy, 1959

Observations were made of the operation of a gas loaded, variable conductance heat pipe two inches in diameter and sixty inches long. The heat pipe was operated in the horizontal and vertical positions while input power was varied from twenty five to one hundred fifty watts. Liquid crystal thermographic techniques were used to observe the temperature gradients existing when non-condensable gases both heavier and lighter than the working fluid had been introduced. Methanol was used as the working fluid; krypton and helium were the non-condensable gases. Isothermal maps, photographs of liquid crystal displays, and summarized temperature data for the various operating conditions are presented.

Master of Science in
Mechanical Engineering
December 1975

Advisor: Matthew D. Kelleher
Department of
Mechanical Engineering

An Optimization Study of a Low
Thermal Potential Power System

James Robert Buckingham
Lieutenant-Commander, United States Navy
B.S., University of Illinois, 1966

A power generating system using the low thermal potential available from the vertical temperature distribution of the ocean is analyzed as a combined engineering and economic mathematical model. The model is optimized for minimum capital cost employing a sequential unconstrained minimization algorithm. Examples of the kinds of engineering and cost information available from the model are presented.

Master of Science in
Mechanical Engineering
and Management
June 1976

Advisors: Matthew D. Kelleher
Department of Mechanical Engineering
William M. Raikes
Department of Operations Research

Heat Transfer Analysis of a Rotating
Heat Pipe Containing Internal,
Axial Fins

Robert David Corley
Ensign, United States Navy
B.S.A.E., United States Naval Academy, 1975

An analytical study was undertaken to determine the two-dimensional wall conduction effects in an internally finned, rotating heat pipe. The finite element method was employed to generate computer results for a copper condenser with triangular fins. Heat transfer rates were shown to be approximately seventy-five percent greater than that predicted by an earlier, one-dimensional analysis. Heat transfer rates were found to be insensitive to rotational speed and fin half-angle. Due to numerical difficulties within the finite element program, no data was obtained for the finned, stainless steel condenser.

Master of Science in
Mechanical Engineering
June 1976

Advisor: P. J. Marto
Mechanical Engineering
Department

Experimental Determination
of Forces on an Oscillating Cylinder

John Burke Field
Lieutenant Commander, United States Navy
B.S., United States Merchant Marine Academy, 1962

A circular cylinder immersed in an infinite viscous fluid and oscillated perpendicular to its axis is acted upon by a fluid dynamic force. This force is generally considered to be composed of two components, a drag and an added mass component. The magnitude of the drag component relative to the added mass component depends on both the frequency and amplitude of oscillation of the cylinder.

It was the purpose of this study to determine experimentally these two components of the force as a function of the ratio of the displacement amplitude to the cylinder diameter and as a function of the Reynolds number based on maximum velocity in the cycle.

The results show that for a Reynolds number less than 100,000 both the added mass coefficient and the drag coefficient are strongly dependent on Reynolds number. At Reynolds number greater than 100,000 the added mass coefficient approaches a constant value of 0.75, and the drag coefficient approaches a minimum of approximately 0.58, then gradually increases at higher Reynolds numbers.

Master of Science in
Mechanical Engineering
December 1975

Advisor: C. J. Garrison
Mechanical Engineering
Department

Forced Oscillations of a Cylinder
in Uniform Flow

Donald Floyd Fortik
Lieutenant, United States Navy
B.S., University of Nebraska, 1970

The mean in-line force and time-dependent transverse force acting on a cylinder undergoing periodic transverse oscillations in a steady fluid flow were measured for various amplitudes, frequencies of oscillation and flow velocities. The experiments were performed in a water tunnel with a closed channel test section. The mean in-line force has been expressed in terms of a mean drag coefficient \bar{C}_{di} and plotted as a function of A/D and $D/\bar{V}T$. The transverse force is expressed in terms of the Fourier-averaged drag and inertia coefficients C_{di} and C_{mi} and plotted as a function of A/D and $\bar{V}T/D$. The results have shown that the mean in-line force is significantly larger than that corresponding to steady flow about a non-oscillating cylinder and that energy may be transferred to the oscillating cylinder from the fluid at or near the vortex-shedding frequencies for the A/D values tested.

Master of Science in
Mechanical Engineering
June 1976

Advisor: T. Sarpkaya
Department of Mechanical
Engineering

The Drag and Lift Characteristics
of a
Cylinder Placed Near a Plane Surface

Selâhattin Göktun
Lieutenant, Turkish Navy
B.S.M.E., Naval Postgraduate School, 1975

Surface pressure, drag and lift coefficients have been experimentally determined for a right circular cylinder located near a plane surface and placed in a cross flow of air. Parametric studies were carried out for Reynolds numbers varying from 90,000 to 250,000, three plate lengths and a variety of cylinder to plate spacings. The variation of the drag coefficient as a function of gap size was found to exhibit an interesting and unexpected trend. The drag was a minimum when the cylinder was resting on the plate and was a maximum at a gap size of approximately one cylinder radius. Flow visualization studies together with detailed measurements of the vortex shedding frequency in the cylinder wake indicate that the plate interferes with the formation of the vortex street in the cylinder wake when it is located within a cylinder radius of the cylinder. This interference disturbs the cylinder base pressure which in turn influences the magnitude of the drag coefficient.

Master of Science in
Mechanical Engineering
December 1975

Thesis Advisor: T. Cooper
Mechanical Engineering
Department

Improvement of an Oil-Water
Pollution Monitoring System

William Ralph Gongaware
Lieutenant, United States Navy
B.S.E.E., North Carolina State University
at Raleigh, 1967

A prototype of an automatic oil monitoring system was improved and used as a tool of research. The system utilizes a direct difference method of total organic carbon determination. The improvements permit a rapid evaluation of the organic carbon content of samples injected into the system to be performed.

The object of the research was to determine operational standards for the type of fluids expected to transport oil into the monitoring system.

Master of Science in
Mechanical Engineering
June 1976

Advisor: Thomas M. Houlihan
Mechanical Engineering
Department

Thermal Studies of a Heated Cylinder
Placed Near a Plane Surface

Ender Kosemen
Lieutenant, Turkish Navy
B.S.M.E., Naval Postgraduate School, 1975

Local and average Nusselt numbers have been experimentally determined around the circumference of a uniformly heated right circular cylinder placed near a plane surface in a cross flow of air. Experiments were carried out for Reynolds numbers ranging from 16,000 to 153,000, three plate lengths and varying cylinder to plate spacings. The variation of the average Nusselt number as a function of gap spacing was found to exhibit an interesting and unexpected trend. The average Nusselt number exhibited a minimum value when the cylinder was resting on the plate and attained a maximum value at a gap spacing of approximately one to two cylinder radii. Flow visualization studies together with measurements of the vortex shedding frequency in the cylinder wake indicate that when the plate is within approximately one cylinder radius of the cylinder, it inhibits the formation of the regular vortex pattern that forms in the wake of a free cylinder. This has a strong influence on the base Nusselt number which, in turn, exerts a controlling influence on the magnitude of the average Nusselt number.

Master of Science in
Mechanical Engineering
December 1975

Advisor: Thomas E. Cooper
Department of
Mechanical Engineering

A Scanning Electron Microscope Study
of the Effects of Anode Velocity
and Current Density on the Corrosion of
Ship Hull Zinc in Synthetic Seawater

William Howard Luebke
Ensign, United States Navy
B. S., United States Naval Academy, 1975

The structure of corrosion products formed on anodic ship hull zinc due to impressed current in synthetic seawater electrolyte was studied as a function of anode velocity, current density, and current-time product. Under dynamic situations, corrosion product growth is discussed for a variety of current densities, and a model is developed considering hydrodynamic and diffusion boundary layer effects on electrical double layer stability. Conditions leading to the formation of various corrosion product types are defined and their development with time is followed. The effects of various velocities, current densities, and current-time products on the development of ZnO platelet networks, ribbonlike corrosion products, and anodic passivation layers are analyzed in static and dynamic environments and models for the sequential observations are developed. A model controlled by current density is offered for static conditions at low and moderate current densities, leading to either non-passivating network layers or compact passivating layers depending on the conditions. A corrosion product growth/removal cycle is hypothesized for very-high current density/high velocity situations which does not lead to zinc anode passivation.

Master of Science in
Mechanical Engineering
June 1976

Advisor: A. J. Perkins
Department of
Mechanical Engineering

Transverse Oscillations of a Circular Cylinder
in Uniform Flow

David William Meyers
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1963

The mean in-line force and the time dependent transverse force acting on a circular cylinder undergoing periodic transverse oscillations in an otherwise steady flow was measured for various amplitudes and frequencies of oscillation at several steady flow velocities. The experiments were carried out in a recirculating water tunnel operating as a closed channel at the test section. The mean in-line force has been expressed in terms of a mean drag coefficient \bar{C}_{di} and plotted as a function of A/D and $D/\bar{V}T$. The time dependent transverse force has been expressed in terms of the Fourier-averaged drag and inertia coefficients C_{dl} and C_{ml} and plotted as functions of the relative amplitude A/D and the period parameter $\bar{V}T/D$. The results have shown that the mean in-line force is significantly larger than that corresponding to steady flow about a non-oscillating cylinder and that energy may be transferred to the oscillating cylinder from the fluid at or near the vortex-shedding frequencies for the A/D values tested.

Master of Science in
Mechanical Engineering
December 1975

Advisor: Turgut Sarpkaya
Department of
Mechanical Engineering

Effective Methods for Solution of Nonlinear Reactor
Dynamics Problems Using Finite Elements

Richard Allen Olsen
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

The solution of the nonlinear two-dimensional reactor dynamics equation subjected to prompt feedback conditions using the finite element technique leads to the matrix formulation $A_{ij}\dot{\psi}_j = B_{ij}\psi_j + C_{ijk}\psi_j\psi_k$ ($i, j, k = 1, \dots, N$). This system has been solved directly in a previous work; but because the nonlinearity $C_{ijk}\psi_j\psi_k$ was premultiplied by $[A]^{-1}$, large computer storage was required for the small problem considered. The task of this thesis is the development of computational techniques which allow the problem to be solved for large systems. Specifically, these techniques are: (1) the treatment of the nonlinearity on the element level, (2) the compacting of the sparse matrices to include only non-zero terms, and (3) the construction of a new computer code based on the Crank-Nicolson formulation for the solution of differential equations.

To support the theory presented, test problems were solved by the original method, the linearized technique, and the Crank-Nicolson treatment. The results were analyzed and compared graphically. All three of the innovations developed in this thesis appear to be useful tools for solving nonlinear time dependent differential equations.

Master of Science in
Mechanical Engineering
December 1975

Advisor: D.H. Nguyen
Co-Advisor: D. Salinas

In-Line Forces Acting on Smooth Cylinders
in Harmonic Flow

Savas Onur
Lieutenant, Turkish Navy
B.S., Naval Postgraduate School, 1975

The in-line force acting on smooth circular cylinders placed in oscillatory flow has been measured using a recently constructed U-tunnel.

The drag and inertia coefficients have been determined through the use of the Fourier analysis and found to depend on Reynolds number as well as Keulegan-Carpenter number for Reynolds numbers about greater than 25,000. A new parameter namely the "Frequency Parameter" has been defined as the ratio of the Reynolds number to the Keulegan-Carpenter number, and the existence of unique relations between the frequency parameter and the drag and inertia coefficients have been shown.

It is recommended that the experiments be extended to even larger Reynolds numbers using the same experimental technique and apparatus.

Master of Science in
Mechanical Engineering
December 1975

Advisor: Turgut Sarpkaya
Mechanical
Engineering
Department

The Influence Of Artificial Cavities On Natural
Convection Heat Transfer From A Horizontal Surface

Apichart Penkitti
First Lieutenant, Royal Thai Army
B.S., Royal Thai Military Academy, 1972

The objective of this project was to study the effect of small artificial cavities on natural convection from a horizontal surface. Tests were run with Freon 113. Data for heat flux as a function of bulk temperature difference were carefully obtained. These data yielded Nusselt number as a function of Grashof number or Rayleigh number. All of these were then compared with the data obtained by Hiep [Ref. 2]. Experimental results are presented for the heat transfer from horizontal circular disks, with and without artificial cavities.

The artificial cavities were found to affect the natural convection heat transfer from a horizontal surface: the heat transfer coefficients increased with the number of cavities.

Master of Science in
Mechanical Engineering
December 1975

Advisor: Mathew D. Kelleher
Mechanical Engineering
Department

Transverse Oscillations of a Cylinder
in Uniform Flow

Paulo Arruda Raposo
Commander, Brazilian Navy

B.S. in Naval Architecture, University of Sao Paulo, 1966
B.S. in Mechanical Engineering, Naval Postgraduate School, 1975

The equation of motion for an elastically mounted, linearly damped circular cylinder subjected to a time-dependent transverse fluid force has been formulated. The steady-state and transient solutions have been obtained in terms of the in-phase and out-of-phase force coefficients, amplitude ratio, and the internal damping of the cylinder. The results have shown that a cylinder may be self-excited in the range of Strouhal frequencies close to the natural frequency of the cylinder. It has further been shown that the heuristic models previously used are inadequate to correctly predict the in-phase or the inertia component of the exciting force. Additional experiments and analysis could enable one to predict the behavior of cables subjected to ocean currents.

Master of Science in
Mechanical Engineering
June 1976

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

Stress Concentration
in
Glass-Epoxy Composite Plates

Sakol Vudhivai
Lieutenant Commander, Royal Thai Navy
B.S., Thai Naval Academy, 1960

This thesis reports a study of the stress concentration caused by holes out of center in thin plates of finite width made of crossply fiberglass composites.

The results are reported in the form of the stress concentration factor, K_{tg} , as a function of two non-dimensional parameters, one representing the influence of the size of the holes and the other representing their eccentricity. Thus graphs plotted for K_{tg} may be used for thin plates with holes of different dimensions.

Master of Science in
Mechanical Engineering
December 1975

Advisor: Milton H. Bank
Aeronautics
Department

TURBULENT FLUX ESTIMATES FROM SHIPBOARD MEAN WIND

AND

TEMPERATURE PROFILES AND DISSIPATION RATES

Harvey Eugene Atkinson III
Lieutenant, United States Navy
B.S., Virginia Polytechnic Institute, 1965

Height profiles of mean wind speed and wind velocity fluctuation spectra are derived from observations made aboard the R/V Acania while anchored in Monterey Bay. The profiles and spectra in conjunction with related temperature fluctuation data obtained in a parallel study are used to calculate the atmospheric boundary layer turbulence parameters: friction velocity, U_* , drag coefficient, C_D , vertical heat flux ($\overline{w'T'}$) and z/L . A general disagreement of the results of this study with each other and with previously published results is inconclusive due to small size of the data base. The best agreement with results of other studies was with the calculation of the drag coefficient using velocity fluctuation data.

Master of Science in
Meteorology
March 1976

Advisor: Kenneth L. Davidson
Meteorology Department

Radiational Parameterization for the
FNWC Primitive Equation Model Using Data
Over the Oceans for 16 July 1974

Terry William Beahan
Lieutenant, United States Navy
B.S., University of Montana, 1967

This study employs a radiational model, with large-scale cloud parameterization in several layers, in order to compute the absorption of solar insolation by the ocean's surface and by atmospheric layers, and to compute the planetary albedo for the FNWC primitive equation model. Solar insolation dispositions were computed on a gridpoint basis using water-vapor mass and cloud amounts. Using emissivity formulas after Sasamori, the long-wave cooling effects were calculated at the earth's surface and over the tropospheric layers, and were found to be dependent upon the cloud parameterization.

FNWC data over oceanic gridpoints for 16 July 1974 were used to test two forms of the cloud parameterization. The objective was to determine the parameterization which better verified the radiational balance at the top of the atmosphere as a function of latitude as compared with satellite climatology. The smaller cloud parameterization gave the better verification.

Master of Science in
Meteorology
September 1975

Thesis Advisor: Frank L. Martin
Department of
Meteorology

The Modelling of Monsoon Circulation

During Northern Summer

James Richard Bellis
Lieutenant Commander, United States Navy
B.S., Colorado College, 1962

The numerical model formulated by Monaco and Williams (1975), which is essentially similar to the UCLA general circulation model, was used to simulate the northern summer monsoon. The model was truncated to a three-level window model which covers the region, 0° - 180° E and 18° S - 46° N only. The zonally asymmetric motions are driven by a specified heating function which resembles the 200 mb seasonal mean divergence field observed by Krishnamurti and Rogers (1970). Major planetary-scale features of the monsoon are reasonably simulated along with development of synoptic scale transient disturbances at upper levels. The results indicate that the present model is suitable for more elaborate studies of the southwest monsoon.

Master of Science in
Meteorology
September 1975

Thesis Advisor: C.-P. Chang
Department of Meteorology

The Influence of Energetic Mesoscale
Eddies on the Ocean Thermal Structure

Willine Elizabeth Christensen
Lieutenant, United States Navy
B.A., Whitworth College, 1967

The influence of internal heating by mesoscale eddies on the oceanic temperature structure is tested by including a vertical heat transport term, $\overline{w'T}$, in the ocean thermal budget equation. The value for this term was determined from a theoretical study by Gill, Green and Simmons (1974). In the past studies of the thermocline problem, the heat transport term has been neglected. Analytical and numerical test cases were run solving the heat equation with and without the mesoscale eddy heat transport term for baroclinic and barotropic conditions in the ocean. Whenever heating by mesoscale eddies was included in the heat equation, excessive cooling occurred in the upper 1000 m of the ocean. The results of the test cases indicate that the eddies do have a distinct influence on the ocean's thermal structure and need to be included in solutions to the heat equation for the ocean.

Master of Science in
Meteorology
March 1976

Advisor: Robert L. Haney
Department of
Meteorology

Use of the
NOAA-2 Digitized Satellite Data
For Diagnosing Marine Fog
in the
North Pacific Ocean Area

Ronald Eugene Hale
Lieutenant, United States Navy

Digital NOAA-2 visual and daytime infrared satellite data and marine surface synoptic reports, North Pacific Ocean, July 1973, are computer processed and diagnosed in an attempt to develop a scheme for identifying fog over open ocean areas as a function of satellite information only. Using approximately 3250 ship observations as ground-truth data, present and past weather, visibility, and cloud cover and type, were sorted into eleven categories and related to the satellite data observed within two hours of the ship report. Critical visual (brightness) and infrared (temperature) count values, separately and in combination, are specified for the purpose of discriminating fog from no-fog marine areas.

Satellite count-value distributions for select categories are illustrated by histograms; the relative accuracies in separating fog from no fog as a function of visual and infrared count values are shown by skill-score analyses.

Master of Science in
Meteorology
September 1975

Advisor: Robert J. Renard
Meteorology
Department

Upper Level Barotropic Instability

Ronnie J. Hartinger
Lieutenant Commander, United States Navy
B.S., San Jose State College, 1963

The structure of barotropically unstable disturbances in the tropics was examined with a two-level quasi-geostrophic model. The forecast equations were linearized and non-dimensionalized and the most unstable mode was found numerically by use of the initial value technique. The wind profile $U_j = a_j U_0 \text{sech}^2(y/L)$ was used. Simple CISK type heating was introduced to determine its effects on the growth of the waves. The jet wind profile was more unstable with easterly flow than westerly flow when no heating or friction was present. When the jet profile was present only at the upper level, the ratio of the disturbance amplitude at the lower level to the disturbance amplitude at the upper level decreased toward the equator. When the heating rate was not large enough to increase the growth rate, the amplitude ratio remained small. As the heating rate becomes larger, the ratio increases to a value larger than 1.

Master of Science in
Meteorology
September 1975

Advisor: Roger T. Williams
Meteorology Department

An Evaluation of the Harbor of Cebu City,
Republic of the Philippines, as a Typhoon Haven

Benny K. Hassell
Lieutenant Commander, United States Navy
B.A., Valdosta State College, 1962

This study is an evaluation of Cebu Harbor as a typhoon "haven." Characteristics of the harbor discussed include facilities available, wind and wave action, storm surge and the topographical effects on winds prior to and during passage of tropical cyclones. Problems to be considered if remaining in port and possible evasion procedures for ships sailing from the port are examined.

The tracks of tropical cyclones from 1947-1974 for the western North Pacific were analyzed to determine the probability of threat to Cebu Harbor. Observations by the author and information obtained in conversations with port and harbor authorities are utilized in reaching conclusions.

In general, the results indicate that Cebu Harbor is not a safe haven. Under threatening conditions, all fleet units capable of evasion at sea should sortie at the earliest possible moment.

Master of Science in
Meteorology
March 1976

Advisor: G. J. Haltiner
Meteorology
Department

Application of a
Finite Element Method to the
Barotropic Primitive Equations

Donald Ernest Hinsman
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

A finite element application to the barotropic primitive equations is presented including theoretical development and the model used. Analytic initial data is generated in order to verify as well as possible the accuracy of the model. A comparison of the model with similar finite difference schemes shows that this finite element method exhibits better phase speed propagation than comparable second and fourth order finite differencing and is competitive in the size of the allowable time step.

Master of Science in
Meteorology
September 1975

Thesis Advisors: G.J. Haltiner
R.T. Williams
Meteorology
Department

An Investigation of
Optically Revelant Turbulence Parameters
in the Marine Boundary Layer

Michele Marie Hughes
Lieutenant, United States Navy
B.A., San Francisco College for Women, 1969

Empirically derived expressions describing the temperature-structure parameter, C_T^2 , in terms of the stability parameter z/L or the Richardson number, Ri , over land were used to analyze data of mean humidity, temperature and wind speed and temperature fluctuations obtained by ship-board measurements over open ocean conditions.

In general, there was little correlation between the spectral analyzed C_T^2 values and z/L or Ri . It is recommended that a different approach be used to obtain C_T^2 estimates and that z/L or Ri be modified to account for the anomalous temperature behavior found over a marine environment.

Master of Science in
Meteorology
March 1976

Advisor: Kenneth L. Davidson
Department of Meteorology

The Prediction of Sea-Surface Temperature
Anomalies Using a 10-Level Primitive
Equation Model

Kenneth Howard Hunt
Lieutenant, United States Navy
B.S., University of Maryland, 1968

Preliminary experiments in the numerical prediction of large scale sea-surface temperature anomalies are made using a 10-level primitive equation model with 300-km horizontal resolution covering a rectangular basin in the North Pacific. The model is first integrated over an 11-year period to statistical equilibrium using time dependent wind and thermal forcing. The monthly normal climatology, generated by the model in this long term integration, is then used along with observed sea-surface temperature anomalies to define the initial state.

The results show that inclusion of salinity in the model may produce more accurate predictions of high latitude cold anomalies. The most accurate of the predictions removed all of the anomalous diffusion terms in the governing equations. Data for the observed temperature anomalies were not available at depth, thus initialization of the anomalies below the surface was superficial. Consequently, the effects of vertical advection were not fully realized, indicating a need for future experimentation with a more accurately defined initial profile of the anomalies in the initial conditions.

Master of Science in
Meteorology
September 1975

Thesis Advisor: Robert L. Haney
Department of Meteorology

Some Design Experiments
For a Nested Grid Forecast Model of
Western Pacific Tropical Cyclones

Gary William Ley
Lieutenant, United States Navy
B.S., The Pennsylvania State University, 1969

A three-dimensional, triply nested tropical cyclone forecast model was initialized from hand-analyzed synoptic-scale wind data. The diagnostic phase forced the mass fields from the wind fields by use of a suitable balance equation. Latent heat parameterization and frictional dissipation were omitted from the model to study movement primarily due to advective processes. For comparison, a three-level uniform coarse mesh grid model was initialized with the same real data. Time averaging of the pressure gradient terms of the momentum equations was incorporated into each model in an attempt to increase the maximum time increment.

Movement forecasts of Typhoon Irma to 48-hours with both dynamic models were compared with operational forecasts and the post-analysis "best" track. Very satisfactory movement prognoses were obtained for the three periods forecasted with the dynamic models. The model correctly forecast the passage of a 500-mb trough to the north of the typhoon, apparently preventing recurvature. For movement forecasts, it appears that the nested model can be initialized with linear interpolation of data from the coarse grid to the finer mesh grids. The time increment was increased through use of the pressure averaging in the uniform CMG model; however, no time step increase was realized with the nested model due to lattice separation of the solution.

Master of Science in
Meteorology
September 1975

Thesis Advisor: Russell L. Elsberry
Meteorology Department

APPLICATION OF MODEL OUTPUT STATISTICS TO TROPICAL CYCLONE
FORECASTING IN THE WESTERN PACIFIC

Robert Ernest Little
Lieutenant - United States Navy
B.S., University of Nebraska, 1970

Analog tropical cyclone forecasting techniques inherently include some mean interaction of the cyclone with its synoptic environment. This investigation seeks to relate current synoptic features to storm displacement. The objective forecasting technique, Model Output Statistics (MOS), along with the so called "ridge regression" biased estimator are used to predict recurvature or non-recurvature of tropical cyclones. Corrections to an analog forecast position are also predicted. It is shown that a larger data set is required before any conclusive results in predicting recurvature or non-recurvature can be made. However, the most fruitful area for application of MOS does appear to be in the recurvature / non-recurvature problem and not in the area of corrections to an analog forecast. The ridge regression estimator generally proves superior to the ordinary least squares estimator as a method of determining predictive equations.

Master of Science in
Meteorology
March, 1976

Advisor: CDR. J.D. Jarrell
Meteorology
Department

Forecasting Marine Fog on the West Coast of
the United States Using a
Linear Discriminant Analysis Approach

Michael Charles McConnell Sr.
Lieutenant, United States Navy
B.A., University of Pennsylvania, 1968

The objective of this study is to develop classification equations to forecast the daily probability of occurrence of marine fog at selected locations on the west coast of the United States, using parameters easily obtainable from upper-air soundings and surface observations. In order to achieve this objective a computerized stepwise linear discriminant analysis program is extensively employed. Data input consists of surface and radiosonde observations for the five-year period 1 July 1968 to 30 June 1973 at three U. S. west coast stations, namely San Diego and Oakland, California and Quillayute, Washington.

Tables showing the number of fog and no-fog cases, the classification functions, and the percentages of correct fog and no-fog discrimination are presented for each station. The most capable fog/no-fog discrimination parameters are discussed for each set of classification equations. Test results for the San Diego equations using a three-year independent data set are also shown.

Master of Science in
Meteorology
September 1975

Thesis Advisor: Robert J. Renard
Department of Meteorology

Radiational Parameterization for the FNWC
Primitive Equation Model Using Data
Over the Oceans for 16 April 1974

William Thurman Meyers
Lieutenant, United States Navy
B.S., North Texas State University, 1965

The radiational model used in this study computes the planetary albedo and absorption of solar insolation by the ocean's surface and by atmospheric layers for the primitive equation model of FNWC. Large-scale cloud parameterization in several layers was utilized in these computations. Solar insolation disposition was computed from the water-mass and the cloud amounts over each gridpoint. Long-wave cooling effects were computed using emissivity formulas after Sasamori at the earth's surface and over the same layers, and were also found to be dependent upon the cloud parameterization.

Two forms of the cloud parameterization were tested using FNWC data over the oceanic gridpoints for 16 April 1974. The objective was to determine the parameterization which better verified the radiational balance as a function of latitude when compared with satellite climatology at the top of the atmosphere for the same general data-period in 1969 (after Raschke, et al, 1973). The better verification resulted with the smaller cloud parameterization values.

Master of Science in
Meteorology
September 1975

Advisor: Frank L. Martin
Meteorology Department

Comparison of Synoptic Scale Wave
Disturbances in the Tropical Western
Pacific Ocean Between 1972 and 1973

Charles Robert Miller, III
Lieutenant Commander, United States Navy
B.S., Pennsylvania State University, 1965

The structure and properties of the tropical easterly waves have been found to vary considerably between different regimes and time periods. This study investigates the possible roles played by the long-term sea-surface temperature (SST) variations in the upstream region on the waves. Time series of tropical western Pacific radio-sonde data during two contrasting 8-month periods of SST anomalies, May-December 1972, which has abnormally high SST in the central and eastern Pacific, and May-December 1973 which has below normal SST in the same region are analyzed. In both periods, the waves have the same periodicity of 4-5 days and a zonal wavelength on the order of 3500 km, but the vertical phase and amplitude distributions are different as well as the thermal structures. The results suggest that SST influences the waves in two ways: 1) direct effect, the warmer SST favors a better-defined warm core structure which increases the lower tropospheric wave amplitude; and 2) indirect effect, the variation of SST changes the large-scale mean wind circulation which, in turn, changes the vertical structure and upper tropospheric amplitude of the waves.

Master of Science in
Meteorology
September 1975

Thesis Advisor: Chih-Pei Chang
Department of Meteorology

A CLIMATOLOGY OF MARINE-FOG FREQUENCIES
FOR THE
NORTH PACIFIC OCEAN SUMMER FOG SEASON

Gary Roland Willms
Lieutenant, United States Navy
B.A., University of Washington, 1967

This study continues the Naval Postgraduate School's development of a computerized program to establish climatological marine-fog frequencies. In particular, fog related information contained in the visibility-weather group elements of the primary synoptic surface reports is segregated into 39 fog categories. Representative fog durations for each category are statistically established from North Pacific Ocean Weather Station summer-season data at Ships P, Q, and S. Climatological frequencies over the North Pacific Ocean, 30-60N, for the months of June, July, August and September are derived from 12 years (1963-74) of OWS and transient ship observations (about three-fourths of a million reports). Comparison to previously published climatological frequencies is made.

Master of Science in
Meteorology
September 1975

Thesis Advisor: R. J. Renard
Department of Meteorology

An Evaluation of the Numazu Operating Area and
Kagoshima Harbor, Japan as Typhoon Havens

Robert F. Wixom
Lieutenant Commander, United States Navy
B.S. Tri-State College, 1962

This study evaluates the Numazu Operating Area and Kagoshima Harbor as possible typhoon havens. Characteristics of the areas under tropical cyclone conditions, including climatology, topographical effects on the wind, and wave action at each location are discussed. Problem areas to be considered if remaining in the operating area/harbor and suggested evasion procedures for ships are examined.

The tracks of tropical cyclones from 1947-1974 for the western North Pacific were analyzed to assess the threat posed to each area by a tropical cyclone. Results show that neither area is an entirely safe haven. The Numazu Operating Area could be a haven under certain specified conditions but only as a last resort. Kagoshima Harbor should never be considered a typhoon haven.

Master of Science in
Meteorology
September 1975

Advisor: G. J. Haltiner
Meteorology
Department

Satellite-tuned Fleet Numerical Weather Central
Radiational Model Applied to the 1973-1974
Data Year over Oceanic Gridpoints

Robert Deane Woods
Commander, United States Navy
B.S., University of Kansas, 1965

This is a final study of a radiational model for use in the FNWC prediction system. This model utilizes original FNWC data over oceanic gridpoints which were adapted to the FNWC five-layer initial data analysis in four mid-seasonal studies for the data year 16 January 1974, 16 April 1974, 16 July 1974 and 16 October 1973.

The radiational model parameterizes the large-scale cloud amounts in two layers. The primary objective was to tune model albedo values to those taken from satellite climatology by changing the cloud-reflection coefficients used in previous studies. The albedo values were tuned for least squares deviation relative to satellite climatology albedos. The present model using tuned albedos better verified the radiational balance at the top of the atmosphere against satellite climatology than did pre-existing untuned models, both on a seasonal and annual basis.

Master of Science in
Meteorology
March, 1976

Advisor: Frank L. Martin
Department of
Meteorology

Fog on the Central California Coast for 1973:

Analysis of Trends

John William Beardsley

Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1964

Surface visibility data for selected stations on the central California coast in 1973 are analyzed. Radiosonde data from Oakland for the same period are used to derive meteorological indices. The year is divided into fog-related seasons, summer and winter, based on fog occurrence on the coast; and the seasonal and daily fluctuations of the indices are examined. A fog development model for the summer is formulated and compared to actual fog cases. In the winter, with far fewer coastal fog observations, the frequent occurrence of frontal passages prevents a standard development model from being formulated and compared.

Four Oakland soundings are compared with four radiosondes taken at NPS Monterey, and the Oakland soundings are found to closely approximate coastal conditions on these days.

Master of Science in
Oceanography
March 1976

Advisor: Dale F. Leipper
Department of Oceanography

Mesoscale Spatial and Temporal Variations of
Water Mass Characteristics in the California
Current Region Off Monterey Bay
in 1973-1974

Richard Edward Blumberg
Lieutenant, United States Navy
B.S., University of Maryland, 1967

Continuous salinity and/or temperature profiles were made off the coast of Monterey Bay monthly between August 1973 and August 1974 and on a spatial grid finer than is conventionally used. A procedure is described to convert the data from analog to digital form, process these data on an IBM 360 computer, and print out the results by station for each month.

The results show water mass features of small spatial scale detectable only because of the small grid spacing. A gyre or filament structure is suggested by the north to south variation between lines of stations. The extent of the area of survey is insufficient to describe completely the water mass structure on both the eastern and western boundaries; however, the temporal variation in the observed water mass structure is consistent with the three oceanographic seasons described for the California Current system. Elements of relatively cold water and relatively warm water masses are identified in the area of survey.

Master of Science in
Oceanography
September 1975

Advisor: Jacob B. Wickham
Oceanography Department

Analysis of the Lindquist Ocean Wave Follower

John William Bonnett
Lieutenant, United States Navy
B.S.E.E., University of New Mexico, 1969

The Lindquist Ocean Wave Follower (LOWFER) is an electro-mechanical device which actively follows the sea surface. Although it measures waves, its primary purpose is to allow turbulence sensors to be placed near the naviface. Results of laboratory and field experiments are presented which demonstrate the degree to which the device can be used in the real environment. LOWFER has a maximum stroke of one meter, a tracking error of less than 7%, acceptable frequency response of up to 4 Hz, and is capable of carrying a 0.5 kg payload.

A second stage tethered catamaran/neutral buoyancy cylinder buoy was constructed and tested in conjunction with LOWFER. When LOWFER is used with the buoy, waves much larger than one meter can be followed. However, serious analysis problems are introduced into turbulence data taken in this manner.

Master of Science in
Oceanography
September 1975

Advisor: Noel Boston
Department of
Oceanography

Ocean Hydroclimate: Its Influence on Climate

Donald Gene Buchanan
Captain, United States Air Force
B.S., University of Missouri, 1969

The statistical synthesis of selected oceanographic parameters (SST, SST anomalies, boundary heat exchanges, etc.) over a specified period of time at a given place or over a given area is defined as ocean "Hydroclimate". Research and etymological background leading to the adoption of the term hydroclimate is discussed. Oceanic influence on atmospheric climate is described. In particular, the ocean's role within the earth's hydrologic cycle and heat budget is explained through hydrospheric, lithospheric, and atmospheric interactions, as related to SST distributions, ocean currents, upwelling, sea-breezes, and monsoons. SST anomalies as a cause of short period climatic variations are examined. The deep-sea sediment record of past SST conditions is shown to indicate past effects of the ocean on climate. A previously defined numerical index describing oceanicity, a quantitative measure of the ocean's effect on climate, is reviewed. An evaluation of hydroclimatic products most useful to meteorologists was prepared and includes a categorized list and individual evaluations of 62 hydroclimatic products.

Master of Science in
Oceanography
September 1975

Advisor: Dale F. Leipper
Department of Oceanography

The Distribution of Suspended Particulate Matter off the
California Coast from San Francisco Bay to Cape San Martín

Lawrence Florian Diddlemeyer
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

The distribution of suspended particulate matter in the 1.4 to 27.9 μ range based on data gathered during four cruises off the California coast from San Francisco Bay to Cape San Martín is presented by means of isometric drawings as well as more conventional graphs.

It was observed that pycnoclines set up particle "traps". In areas where a deep mixed layer existed particle concentrations were randomly distributed in the layer. Counts of larger sized particles decreased with depth; those for smaller particles appeared to remain about constant throughout the water column.

Particle sizes and distributions reflected bottom topography and water depth. Shallow water stations exhibited higher particle concentrations, while stations over Monterey Canyon showed depressed counts over the entire size range. In localized upwelling areas higher concentrations around the areas' peripheries than in their centers were found. Data were assumed to follow a distribution of the form $M_i = K(1 - 2^{C/3})$, where M_i = count in Coulter counter channel number i , and K and C are constants; (diameter in microns = $27.9 \times 2^{-i/3}$, $i=0,1,\dots,13$). C values generally occurred in the 2.4 to 3.1 range, but significant deviations were noted during upwelling. K values often fell in the 50 to 300×10^3 particles/ml range, but extremely high values were noted for the Davidson Current period. Phytoplankton blooms appeared to be responsible for "knees" or "peaks" in many of the size distributions.

Master of Science in
Oceanography
December 1975

Thesis Advisor: Stevens P. Tucker
Oceanography Department

Subtidal Concrete Piling Fauna
in
Monterey Harbor, California

Winfield Donat III
Lieutenant, United States Navy
A.B., University of North Carolina, 1967

Piling organisms were scraped off one side of a concrete piling from the bottom to the low intertidal zone beneath Municipal Wharf No. 2 in Monterey Harbor, California. Sampling was performed at 0.5 m^2 surface area increments. Wet biomass measurements were taken, the organisms were identified and an evaluation of species abundance in each sample was made. Data are given by a Table of Species with abundance in each sample, a Species List with comments on particular organisms, drawings representing the more prominent animals observed and in situ photographs of various piling animals.

Master of Science in
Oceanography
September, 1975

Advisor: Eugene C. Haderlie
Oceanography
Department

Bathymetric Interference of Long-Range,
Low-Frequency Sound Propagation - Volume Two

Walter Patrick Donnelly
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

and

Geoffrey Alan Whiting
Lieutenant, United States Navy
B.S., University of Miami, 1968

(U) The gross effects of bathymetric interference of long-range, low-frequency sound propagation were investigated using a multi-step approach. The aperture or ray angle limits of viable acoustic rays, identified through receiver geometry, were mapped into an acoustic source region using the "phase integral," a ray invariant characteristic initially identified by Weston (1958). This was applied to the source and receiver region sound speed profiles in the aperture mapping process. Secondly, representative rays within the transformed aperture of the source region were traced using a perfectly flat bottom. A prominent segment of the actual source region bathymetry was then applied to the ray trace at incremental ranges from the source. By counting the percentage of rays intersecting the bottom profile at each range step, bathymetric blockage as a function of relative source separation from the bathymetric feature was determined. A comparison was then made with actual acoustic projector tow data from the same geographical area and time of year. This process was then developed into a computer model.

Master of Science in
Oceanography
June 1976

Advisor: R. H. Bourke
Oceanography
Department

Tidal and Current Prediction for the Amazon's North Channel
Using a Hydrodynamical-Numerical Model

Luiz Antonio de Carvalho Ferraz
Lieutenant Commander, Brazilian Navy
B.S., Naval Post Graduate School, 1974

The hydrodynamical-numerical prediction model developed by W. Hansen is applied to the North Channel of the Amazon River for computation of tides and currents; the results are compared with tidal prediction obtained by the harmonic method and to actual current measurements. A medium size grid of square mesh cells, 1800 m in length, represents the North Channel. The driving forces are the tides at the northern opening of the channel near the river's mouth and the river discharge into the channel at the southern end. The numerical results for tides were verified at three tidal stations, and it was observed that the tides predicted at the northern part of the channel agreed, in the worse case, within 12% of the tidal range, but those predicted at the southern end were unsatisfactorily reproduced. This fact is attributed to the size of the grid which is too coarse to describe adequately the variable and irregular cross-sections and bottom topography at the southern part of the channel. The predicted currents were in acceptable agreement with the few available measurements.

Master of Science in
Oceanography
September 1975

Advisor: Stevens P. Tucker
Oceanography Department

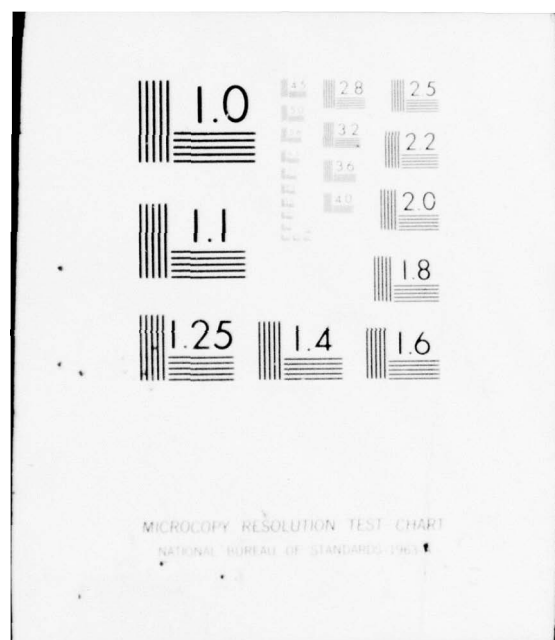
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Kinematics of Surf Zone Breaking Waves:
Measurement and Analysis

James Joseph Galvin
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

Simultaneous measurements of water surface fluctuations and horizontal water particle velocities in a line perpendicular to the direction of wave approach extending across the surf zone were taken in varying surf conditions at two locations. The spectral velocities calculated using linear theory as a transfer function underestimated measured values by 79-86% at the peak of the spectrum. The coherence values were generally low indicating non-linear and turbulent conditions. Strong harmonics in the spectra of the waves and water particle velocities further suggest a non-linear system. The theoretical phases computed using linear theory did not accurately predict the observed phases. In general breaking waves can be characterized as a strongly non-linear wave phenomenon. Measured frequency distributions were compared with both Gaussian and Gram-Charlier distributions by using the chi-square goodness-of-fit test. Qualitatively, the Gram-Charlier distribution gave the better fit to the flow velocity data.

Master of Science in
Oceanography
September 1975

Advisor: Edward B. Thornton
Oceanography
Department

Mesoscale Components of the Geostrophic Flow
and its Temporal and Spatial Variability
in the California Current off Monterey Bay
in 1973-74

Richard Earl Greer
Lieutenant, United States Navy
B.A., Frostburg State College, 1967

The mesoscale components of the geostrophic flow and its temporal and spatial variability are discussed for the oceanic region west of the continental shelf off Monterey Bay. The results were obtained from spatially dense observations on thirteen cruises during the period August 1973 through August 1974.

Patterns of current flow indicated by drogues and geostrophy tend to confirm an analysis of the structure which has alternating elements of poleward and equatorward flow. Surface current flow patterns are similar to those found at depths to 375 m. The bottom topography influences the direction of flow inside the 1,000 fathom curve.

Seasonal variations of the geostrophic flow and salt transport were congruent with Skogsberg's [1936] annual cycle composed of three distinct oceanographic seasons.

The flow and structure in the area are complex with flow elements less than 10 km in width. The data suggest that observations on a sampling grid length less than 10 km transverse to the current flow, and extensive independent current measurements are required to describe adequately the small-scale features of the flow, structure and its time variations.

Master of Science in
Oceanography
September 1975

Advisor: J. B. Wickham
Oceanography Department

Currents in Monterey Submarine Canyon

John Edward Hollister
Lieutenant, United States Navy
B.S., University of Hawaii, 1969

Time series were obtained from two current meters near bottom on one mooring in Monterey Submarine Canyon. These records were analyzed to determine the general character of the currents, the volume transport at different levels above the canyon floor, the power spectral estimates of the up-canyon and cross-canyon directional components, and the coherence between directional components.

Current speed variations appeared as a series of peaks occurring every 5 to 6 hr with maxima of 17 to 21 cm/sec. Current directions oscillated with a discernable period of about 12 hr. Currents 30 m above the bottom were aligned nearly along the canyon axis; currents 60 m above the bottom were nearly perpendicular to the canyon axis.

The spectral analysis indicated tides as a major driving force of the deep currents, but also indicated the presence of other forcing functions, possibly internal waves, with shorter periods. The coherence between instruments was low, suggesting the possible presence of a near-bottom boundary layer, or that significant signal deterioration was caused by noise.

Master of Science in
Oceanography
September 1975

Co-Advisor: Robert S. Andrews
Co-Advisor: Robert G. Paquette
Oceanography Department

The Spatial and Temporal Variation of Sound
Speed in the California Current System off
Monterey, California

John George Hughes
Lieutenant, United States Navy
B.S., University of Washington, 1970

The horizontal sound speed in an area of complex oceanographic structure was described using cross sections obtained from six nonconsecutive monthly lines of STD observations at a 5.5 km sampling interval off Monterey, California.

The sound speed field for each section was determined and visually analyzed. Cross-correlation functions of vertical sound speed gradients averaged over 2 m and 10 m increments were computed between stations. Cross-correlation coefficients between stations were computed for detrended sound speed profiles sampled at 2 m depth increments.

Sound speed was an excellent descriptor of water mass features. On depth scales greater than 10 m, well defined sound speed field features showed horizontal extents of less than 11 km in some cases. On vertical scales of 2 to 10 m horizontal extents of less than 11 km were also evident. Sound speed profiles showing similarities on the scale of 2 to 10 m tended to occur at 27.5 to 38.5 km intervals.

Master of Science in
Oceanography
December 1975

Thesis Advisor: J. Wickham
Oceanography
Department

The Descriptive and Dynamic
Oceanography of the Mesostructure
near Arctic Ice Margins

Allan Eugene Karrer
Lieutenant, United States Navy
B.S., Drexel Institute of Technology, 1968

Complex temperature anomalies observed near Arctic ice margins in the Chukchi Sea were found to be associated with the interaction of the warm coastal current with the ice cover and resident bottom water. These anomalies were characterized by large temperature gradients found in areas of very low density gradient. They were in the form of inversions, interleavings, and discrete parcels which varied greatly in short distances. The processes which produced mesostructure were directly linked to the presence of ice and were found to affect the entire water column. Structure was found in the vicinity of the ice margin but was observed to dissipate well inside the ice margin. A dynamic high was found which was related to the melting of ice and characteristically occurred in the melting zone of the ice margin. This dynamic high was limited to a depth of 10 meters and is believed to be a factor in the deepening of mesostructure elements and other phenomena as they pass the ice margin with the current.

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Master of Science in
Oceanography
September 1975

Advisor: R. G. Paquette
Oceanography
Department

Apparent Surface Currents over the
Monterey Submarine Canyon
Measured by the Method of
Towed Electrodes

Karl Arthur Mahumed
Lieutenant, United States Navy
B.S., U.S. Naval Academy, 1968

Five data cruises were taken on board R/V ACANIA to study the effect on the Geomagnetic Electrokinetograph (GEK) of various environmental factors, including winds, tides, and internal waves, over the Monterey Submarine Canyon. An in situ current meter was used successfully on one occasion to obtain data to establish a k-factor for the GEK in the Submarine Canyon, and to directly measure the particle velocities of internal waves. The observed surface currents measured with the GEK all exhibited little or no correlation with winds and tides. The flows were all generally southerly; their averages agreed with previous measurements made with the GEK. This direction of flow was opposite to the generalizations of Scott and possibly agreed with those of Pirie, depending upon the placement of one of his eddies. The k-factor for the GEK could not be determined because currents measured directly in the thermocline were found to be not correlated with the GEK measurements. However, the average current speeds were in reasonable agreement with currents measured at other times in Monterey Bay, leading to the conclusion that k cannot be much greater than the assumed value of 1.0.

Master of Science in
Oceanography

Advisor: R. G. Paquette
Oceanography
Department

Wind Stress and Wind Stress Curl
over the California Current

Craig Scott Nelson
Lieutenant, National Oceanic and Atmospheric Administration
B.S., Yale University, 1971

Historical surface marine observations are summarized by 1-degree square area and long term month to describe the seasonal distribution of wind stress over the California Current. Off the coasts of southern California and Baja California, an alongshore equatorward component is present throughout the year. The distributions north of Cape Mendocino are characterized by marked changes in direction and magnitude between summer and winter. The predominant wind stress maximum shifts northward coherently from off Point Conception in March to south of Cape Blanco in September, and extends approximately 500 km in the offshore direction and 1000 km in the alongshore direction. Maximum values of surface wind stress occur during July near Cape Mendocino.

The wind stress curl is positive near the coast and negative in the region offshore. A line of zero wind stress curl parallels the coast 200 km to 300 km offshore, except off central Baja California. The patterns of wind stress curl are consistent with the existence of a southward Sverdrup transport offshore and a poleward transport near the coast.

Master of Science in
Oceanography
June 1976

Advisors: R.L. Haney
Department of
Meteorology

J.B. Wickham
Department of
Oceanography

Analysis of Wave-Induced Errors in
Turbulent Flux Measurements

Gerald Karl Nifontoff
Lieutenant, United States Navy
B.S.E.E., Rensselaer Polytechnic Institute, 1969

Near surface measurements of turbulent temperature and velocity fluctuations in the ocean are obscured by relatively much larger ordered fluctuations due to surface gravity waves. Analysis of measured velocity signals in the near surface region indicated that the ratio of turbulent to wave-induced kinetic energy was consistently less than 10^{-1} . To a first approximation, wave-induced fluctuations should not contribute to turbulent transport. However, small instrument errors due to misalignment, phase response, or directional response may cause significant wave-induced error in direct flux measurements. The effect on turbulent flux measurements of misalignment of the velocity sensors was examined. It was found that misalignment resulted in apparent phase shifts in the measured wave-induced signals, causing erroneous contributions to the calculated flux. For alignment errors of 3.6° , the error in calculated momentum and heat fluxes could have been up to 500% and 110%, respectively. Momentum flux measurements made in deep water (with respect to the length of surface waves) were found to be less sensitive to alignment errors. The errors in this case were functions of the alignment of the flowmeter axes with the predominant wave direction

Master of Science in
Oceanography
September, 1975

Advisor: Edward B. Thornton
Oceanography
Department

A Computer Simulation Model
of Seasonal Variations in Ocean Production
for a Region of Upwelling

Robert Thomas Pearson
Lieutenant, United States Navy
B.S., Oregon State University, 1970

A computer model simulating the seasonal variations of mixed layer nutrient concentrations, phytoplankton biomass carbon, and herbivorous zooplankton biomass carbon was developed. The simulation was generated using an annual cycle of four environmental parameters: (1) incident solar radiation, (2) upwelling velocity, (3) mixed layer depth, and (4) mixed layer temperature. Simulation results were compared with nutrient and zooplankton biomass data collected on a series of seven cruises made in central Monterey Bay from February through December, 1974. Both observed and simulated zooplankton stocks were characterized by two distinct maxima. The initial peak (1.05 gC/m^2) occurred in late July and was followed by a decline in populations through the month of August. During the fall and early winter, zooplankton biomass increased rapidly to an overall maximum of 1.85 gC/m^2 . Individual environmental parameters were tested to ascertain their importance in controlling simulation results. Phytoplankton stocks were influenced principally by changes in incident radiation, whereas temperature variations produced the most significant fluctuations in zooplankton biomass. Simulation responses suggest that upwelling, in addition to providing nutrients for primary production, enhances zooplankton productivity by bringing colder deep water to the surface, thereby reducing zooplankton respiration requirements.

Master of Science in
Oceanography
September, 1975

Advisor: Eugene D. Traganza
Oceanography
Department

Fog Sequences On the Central California Coast
With Examples

Craig Allen Peterson
Lieutenant, United States Navy
B.S., Carroll College, 1968

In the low visibility range, forecasts during the summer period along the west coast of California are presently not made with any degree of accuracy. Modeling sequences associated with the non-frontal fog formations during the summer period offer the possibility of improving fog diagnosis. Such sequences have been in use in Southern California for some time.

This study uses a synoptic approach, focusing on sequences observed in the non-diurnal aspects of coastal fog. A development model is presented in order to delineate patterns of the fog phenomenon along the Central California coast. Actually observed fog situations are presented in order to evaluate the model and determine if day-to-day changes in specific non-diurnal indices represent trends which can aid forecasters.

Results show that, although the model is general in nature, a correlation between the stages of the model and observed fog exists. The relationship of the time of occurrence of dense fog and the trends in the height of the inversion base and daily maximum temperatures at the top of the inversion and the inland valley are pointed out.

Master of Science in
Oceanography
September 1975

Advisor: Dale F. Leipper
Oceanography
Department

A Comparison of Satellite Images Capable
of Detecting Ocean Surface Features

Bruce William Platz, Jr.
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1971

This study compares the capabilities of the images obtained from the archives for the satellites of National Oceanic and Atmospheric Administration (NOAA), Defense Meteorological Satellite Program (DMSP), and Earth Resources Technology Satellite (ERTS) systems for displaying information about oceanic currents and circulation features. Although these systems were not designed to collect sea surface data, large scale coastal phenomena have been detected in the imagery of all three. In this analysis of the imagery, the ERTS data proved to be the most useful for displaying coastal processes, especially mixing and sediment transport, because of their availability and sensor abilities to detect sediment. The DMSP archived images proved to be of little value for looking at sea surface features. The NOAA archived images were scarce and only a few of the images requested during this investigation were available. The sensors showed a susceptibility to many atmospheric contaminations, primarily water vapor, which prevented delineation between sea and air phenomena at times. However, special image products were found which displayed sea surface features and flow patterns representative of flow around islands, points of land, and mixing.

Master of Science in
Oceanography
September 1975

Thesis Advisors: J.J. von Schwind
E.B. Thornton
Oceanography
Department

Climatological Wave Statistics Derived
from
FNWC Synoptic Spectral Wave Analyses

Felix Michael Reynolds
Lieutenant, United States Navy
B.S., University of Washington, 1966

A summer and winter month of 12-hourly synoptic spectral wave analyses produced by the Fleet Numerical Weather Central, Monterey, California were used to develop three experimental wave climatology formats for a point in the Gulf of Alaska; the analyses were produced by the Spectral Ocean Wave Model at FNWC which computes the wave energy contained in 12 direction bands and 15 frequency bands for a grid point array in the Northern Hemisphere oceans. The gross climatology format displays frequency of occurrence of significant wave height by period and direction, but does not differentiate between sea and swell. The two-dimensional spectral climatology format is a tabulation of the frequency of occurrence of spectral energy in various frequency and direction bands. The one-dimensional spectral format displays the distribution of spectral wave energy over various frequency bands but contains no directional information. Both of the spectral formats appear to have their greatest potential application in resonance response of floating and fixed structures.

Master of Science in
Oceanography
June 1976

Advisor: Warren C. Thompson
Department of
Oceanography

Transient Ship Synoptic Reports, An Evaluation
of Their Contributions to a Fog Study of
19 August-5 September 1974 and 1-5 December 1975

Joseph Austin Schrock
Lieutenant, United States Navy
B.A., Franklin and Marshall College, 1968

Coastal fog studies have always alluded to offshore marine fog development by extending known observations along the coast seaward. This study attempts to establish the offshore conditions during one such coastal fog study through the analysis of transient ship synoptic reports.

Over 1400 ship reports occurring off the coasts of California, Oregon, and Washington during two weeks in August 1974 and one week in December 1975 were analyzed. The visibility-weather group elements of the ship reports along with daily NOAA II satellite photographs were used to establish fog location and boundaries. Other synoptic parameters such as air temperature, pressure patterns and sea surface temperature were studied in an attempt to determine reasons for marine fog development. An evaluation of the credibility and reliability of transient ship synoptic reports also was made. It was found that of all the reports indicating fog, 36 percent were in violation of the World Meteorological Organization (WMO) procedures and definitions.

Results indicate that although there are a significant number of inconsistencies and problems associated with ship reports, they can provide numerous products useful in establishing offshore marine fog conditions. These products, fog location charts, sea surface temperature charts, air temperature minus sea surface temperature charts, and surface trajectories, do lend support to existing synoptic models of the fog formation processes along the California coast.

Master of Science in
Oceanography
June 1976

Advisor: Glenn H. Jung
Department of Oceanography

High Frequency Temperature Fluctuations
in the Atmospheric Boundary Layer

Robert Thomas Simril
Lieutenant, United States Navy
B.S., North Carolina State University, 1969

Turbulent temperature fluctuations in the atmospheric boundary layer measured at 2m, 7m and 23m in Risø, Denmark, were analyzed with particular emphasis placed on determining characteristics of the high frequency region of the spectra of these fluctuations. The shape of the high wave number one-dimensional temperature spectrum and an estimate of the Kolmogorov scalar constant were determined. Comparisons of high frequency spectral regions of temperature and velocity fluctuations were made.

Master of Science in
Oceanography
September 1975

Advisor: N. E. J. Boston
Oceanography
Department

Oceanography, Mesostructure, and Currents
of the Pacific Marginal Sea-Ice Zone -
MIZPAC 75

William John Zuberbuhler
Lieutenant Commander, United States Navy
B.S., Xavier University, 1962

and

John Alexander Roeder
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

Currents and complex temperature inversions observed in the Chukchi Sea during MIZPAC 75 were investigated in a further effort to define the mechanisms for the formation of mesostructure. Data was collected using a conductivity-temperature-depth (CTD) recorder and a Savonius Rotor Current meter. Whereas in previous MIZPAC cruises mesostructure was typically observed in the vicinity of ice margins, during MIZPAC 75 it was primarily found in regions of diffuse ice flows and in the open water ice-melt region up to 96 km south of the ice margin. The nature of the mesostructure varied fairly systematically with ice diffuseness and distance from the ice margin. There was little correlation of mesostructure with current direction but a possible correlation with current strength. Mesostructure existed in the same spot for as much as two days with little change, a finding of possible significance to theories of double diffusion. A highly unusual warm bottom water on the Chukchi shelf is presumed to have originated in the Atlantic Layer of the Arctic Ocean.

Master of Science in
Oceanography
September 1976

Thesis Advisors: R. G. Paquette
R. H. Bourke
Department of Oceanography

Kolmogorov-Smirnov Test For
Discrete Distributions

Mark Edward Allen
Lieutenant, United States Navy
B.S., University of California, Davis, 1968
M.S., University of West Florida, 1970

The Kolmogorov-Smirnov goodness-of-fit test is exact only when the hypothesized distribution is continuous, but recently Conover has extended the Kolmogorov-Smirnov test to obtain a test that is exact in the case of discrete distributions. Reasons for using this procedure instead of the regular Kolmogorov-Smirnov test when the hypothesized distribution is discrete are given. A computer subroutine is developed to allow easy use of the procedure. The subroutine is then used to demonstrate the conservatism of the regular Kolmogorov-Smirnov test in this case and to investigate some properties of the asymptotic distributions of the test statistics.

Master of Science in
Operations Research
March 1976

Advisor: Donald R. Barr
Department of Operations
Research and Administra-
tive Science

The Significant Parameters Affecting the
Modelling of Target Acquisition of Ground
Combat Targets from Tactical Helicopters

Basil Grahame Baskerville
Major, Canadian Armed Forces
B.S., University of Bishops College, 1955

The acquisition of ground targets in combat from tactical helicopters, employing low-level flying techniques, is a complex process. The author examines the air-to-ground target acquisition process and investigates the parameters affecting this process. The tactical environment of helicopters is outlined and those parameters deemed significant and/or peculiar to this environment are identified. Current mathematical models of air-to-ground target acquisition are reviewed. Those which are considered relevant to this particular problem are described. The author concludes that there are no validated models for predicting target acquisition from tactical helicopters.

Master of Science in
Operations Research
June 1976

Advisor: James G. Taylor
Department of Operations Research
and Administrative Sciences

A Proposed Solution to the Three Step
Discrete Evader Pursuer Game

Donald Robert Bouchoux
Lieutenant, United States Navy
B.A., Boston College, 1968

A method for obtaining a near-optimal solution to the three step discrete evader pursuer game is presented. Additionally, data storage requirements resulting from this solution are greatly reduced from those of previous near optimal solutions to the game.

Master of Science in
Operations Research
March 1976

Advisor: A. R. Washburn
Department of
Operations Research

by

Dennis W. Brewer
Major, United States Army
B. S., United States Military Academy, 1965

This thesis studies the infantry small unit dismounted final assault by varying such parameters as tactics, suppression, and weapons mix in a critical event computer simulation model. Six attackers armed with Soviet weapons are pitted against two defenders armed with American weapons and positioned in a parapet foxhole. The combatants' combat strategies are determined by a heuristic search procedure that "maximizes" the average value of a figure of merit by systematic variation of the strategic variables. This heuristic procedure is applied first to the attackers' strategy and then to the defenders' strategy. Finally, some traditional maxims of infantry small unit operations are investigated. Future possible research is suggested.

Master of Science
in
Operations Analysis
March 1976

Advisor: James G. Taylor
ORAS Department

The Social Welfare Under
Stochastic Demand

Nguyen Minh Cang
Lieutenant (junior grade), Republic of Vietnam Navy
B.S., Faculty of Science in Saigon, 1969

The purpose of this paper is to continue to develop the social welfare model of Brown and Johnson [The American Economic Review, March, 1969, page 119]. We introduce a normal distribution (μ, σ^2) with mean μ , variance σ^2 as the characterization of the risk that additively enters the product demand function facing the firm. The optimal price still equals the short run marginal operating cost. We observe the optimal output when the mean or variance of risk increases, using the least-square method. We estimate the linear relation between the optimal output and mean or variance of risk.

In the second model we introduce the expected monopoly profit and observe how both the optimal price and output vary as the mean or variance of risk changes. As the final step, we compare the results of two kinds of models, and find that which is the least affected by risk.

Master of Science in
Operations Research
September 1975

Thesis Advisor: P.M. Carrick
Operations Research and
Administrative Sciences
Department

A Numerical Evaluation of the Liouville-Green
Approximation of Variable-Coefficient
Lanchester-Type Equations of Modern Warfare

James N. Carpenter
Captain, United States Army
B.S., United States Military Academy, 1969

This thesis evaluates the so-called Liouville-Green approximation to the solution of variable-coefficient Lanchester-type equations for combat between two homogeneous forces. When compared to the form of the exact solutions, this approximation is in terms of "elementary" functions. Two specific forms of attrition-rate coefficients are considered, allowing for different maximum effective ranges of the two opposing weapon systems. These coefficients might be used to model a constant-speed attack against a static defensive position. It is shown that for these attrition-rate coefficients, the Liouville-Green approximation is not consistently reliable for predicting force levels, and yields exact results only under certain restrictive conditions. Furthermore it was found that methodology is not presently available to accurately predict from Liouville's normal form the error which will be incurred by invoking the approximation in a specific situation.

Master of Science in
Operations Research
March 1976

Advisor: James G. Taylor
Operations Research
and Administrative
Sciences Department

Relative Robustness
of Several CEP Estimators

Tzu Ming Chen
Lieutenant, Chinese Navy
B.S., Chung Cheng Institute of Technology, 1970

This thesis presents a discussion of the problems involved in estimation of Circular Error Probable (CEP). Several estimators are compared through simulation, under two models; the power model and the Rayleigh model. Several measures of effectiveness are calculated for each of the competing estimators. It is found that maximum likelihood estimation based on the power distribution performs well for "heavy tailed" distributions; the Rayleigh unbiased estimator performs well for most other situations.

Master of Science in
Operations Research
March 1976

Thesis Advisor: D. R. Barr
Operations Analysis
and Administrative
Sciences Department

Network Transformations
and Some Applications

Yue Pui Cheong
Major, Singapore Armed Forces
B.S., Queen's University of Belfast, 1966

The growing number of large scale applications of network models and the availability of very fast solution codes make it attractive to formulate problems as networks whenever such models are adequate for the purpose. In this thesis, conceptualization of, and notation used to express these models is based on the interpretation of physical flows of commodity through a network structure of nodes and arcs. As an aid to modelling, and to allow codes of varying specificity to be used, nine well-known Transformations are catalogued here for easy reference.

Two recent results for special cases of the multicommodity flow problem are re-derived and in the case of (1) below, is significantly extended: (1) The case with all capacitated arcs in the network structure incident with one common node. (2) The case of a transportation structure with two sinks (or two sources). Using the network approach, these are shown to have equivalent network formulations.

Lastly, a Transformation which uncapacitates a network is implemented in various ways into a contemporary solution code named GNET.

Master of Science in
Operations Research
December 1975

Advisor: Gordon H. Bradley
Operations Research and
Administrative Sciences
Department

Regression Analysis
with
Correlated Observations

Kyu Ryun Chung
Lieutenant Colonel, Republic of Korea Army
B.S., Republic of Korea Military Academy, 1962
B.S., Seoul National University, 1966

The regression model $\underline{Y} = \underline{XB} + \underline{e}$, with $\underline{e} \sim N(\underline{0}, \sigma^2 \underline{I})$, has been studied extensively. That is, the model in which the errors are independent and identically distributed as $N(0, \sigma^2)$ has been studied already.

In this thesis we study the model in which the sample observations are correlated with a prescribed correlation structure and show that many of the results available for the independent case apply equally well for the correlated samples.

We shall find that some results obtained here are not just the same as the case where the errors are independent and identically distributed as $N(0, \sigma^2)$.

Master of Science in
Operations Research
September 1975

Advisor: Toke Jayachandran
Mathematics
Department

Human Performance and Biorhythms

William Wilson Cobb, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

Using a serial memory task, human performance and biorhythms were studied in the laboratory for a fifteen week period. The purpose of the experiment was to determine whether dependency between human performance and biorhythmic cycles existed for the subjects observed. Analysis of the data using the Chi-Square Contingency Test collected from 4 subjects showed a significant dependency at the .05 level existed between 2 of 3 biorhythmic cycles and human performance as well as near significant dependency existing for the third cycle and human performance. Further analysis using the χ^2 one sample test showed no significance between critical days and categories of performance at the .05 level.

Master of Science in
Operations Research
September 1975

Advisor: D.E. Neil
Department of
Operations Research

The Effect of Uncertainty
on
Lanchester-Type Equations of Combat

James David Craig
Captain, United States Army
B.S., United States Military Academy, 1968

This thesis examines whether the complex random process of combat can be adequately represented by a deterministic model. Does one destroy any of the essential features of the random combat process by considering a deterministic model as representing the "average" course of combat? Insights into the fundamental differences between deterministic and stochastic models are obtained by comparing the deterministic and stochastic versions of the so-called Lanchester "square-law" attrition process. Three aspects of the models are compared, with several hypotheses examined for each: Probability of winning, the expected force level time history, and the variance of the expected force levels. From the analysis it is concluded that if the forces are not near parity, and if the initial force levels are relatively "large," a deterministic model can adequately represent combat.

Master of Science in
Operations Research
September 1975

Thesis Advisor: J.G. Taylor
Operations Research and
Administrative Sciences
Department

A Simulation Model for
Multi-Channel, Time-Dependent Queueing Systems
and an Application to Test and Evaluate
an Analytical Model of the U. S. Army
Acute Minor Illness Clinics

Bruce Byron Culmer
Lieutenant, United States Navy
B.A., Eastern Nazarene College, 1968

Many organizations exist within the Department of Defense which exhibit the properties of multi-channel, time-dependent queueing systems. One such system is the Army's Acute Minor Illness Clinic (AMIC). Models of this system can be developed to determine optimum staffing levels and to upgrade the quality of service provided.

This study developed a time-dependent simulation program which was applied to a two queue, multi-channel queueing system. In particular, this model was designed to test and evaluate the results of an analytical model of the AMIC. The results of both of these models are compared to a second simulation program which more closely models the AMIC in order to measure the significant differences between it and the two other models.

Master of Science in
Operations Research
September 1975

Advisor: R. W. Butterworth
Operations Research
Department

Pilot Reported Human Factor
Cockpit Discrepancies in Naval Aircraft

Gene Leroy Daniels
Commander, United States Navy
B.S., Stanford University, 1960

This thesis investigates the problems in current naval aircraft cockpits as perceived by fleet naval aviators who are students at the U.S. Naval Aviation Safety School. A critical incident questionnaire provides data that examines the deficiencies of an individual aircraft. These individual aircraft deficiencies are then categorized into twelve major deficiency categories which are common to more than one aircraft. Various recommendations are made concerning standards, specifications, cockpit research and cockpit design.

Master of Science in
Operations Research
March, 1976

Advisors: Lewis E. Waldeisen
Douglas E. Neil
Dept. of Operations
Research & Administrative
Sciences

Small Independent Action Force (SIAF)
Vegetation Classification Study

Wayne E. Deutscher
Major, United States Army
B. S., The Colorado College, 1963

This study was conducted to examine the Small Independent Action Force (SIAF) Model's vegetation classification scheme. The SIAF Model has as its basis an ordinal scale based upon density and type of vegetation. An interval scale based upon individual judgments was established which did not correlate with the model's scale in two instances. SIAF Class 6 was judged as most difficult with respect to intervisibility and SIAF Class 3 was judged more difficult than SIAF Class 4. An attempt was made to determine how well an individual could determine the classification of a scene utilizing the existing SIAF Classes. Results indicated that individuals attained a correct response of 43.6%. It was also determined that there was negative intraclass correlation using the Intraclass Correlation Coefficient. No prediction can be made as to how an individual would respond to identical stimuli. There was found to be no learning effect by the subjects in determining correct SIAF Class discriminations.

Master of Science in
Operations Research
March 1976

Advisor: James K Arima
Operations Research
Department

Optimizing the Placement of Guidance Arrows
on Highway Signs

George Allen Emerson, Jr.
Lieutenant, United States Navy
B.S., University of Illinois, 1967

This paper describes a design and experimental study of the placement of guidance arrows on highway guide signs. This study was conducted under laboratory conditions. Ten subjects were shown a series of slides depicting three destinations, three directions and three sign designs under controlled instruction and exposure duration; they were required to respond to a previously determined cue as quickly and as accurately as possible. The measured variables were response time and correctness of the response. Classical statistical tests were used to conduct the analyses. The analyses were made to determine the optimum guidance sign design regarding the arrangement of arrows and destination names.

Master of Science in
Operations Research
September 1975

Advisor: Douglas E. Neil
Operations Research/
Systems Analysis
Department

A Feasibility Study
for Determining a Small Arms Measure of Effectiveness
for Handling Characteristics

Charles Leslie Featherstone
Captain, United States Army
B.S., Washington State University, 1965

Richard John Scaglione
Captain, United States Army
B.S., United States Military Academy, 1968

This report is a feasibility study of using the time recorded for an individual to accomplish a series of errorless movements and firing tasks as a measure of the handling characteristics of small arms weapon systems and to investigate whether this measure of effectiveness can be used to discriminate between two or more systems. Information theory was used to develop index of difficulty measurements for the performance of the shooting tasks.

Eight subjects were used in the experiment. The subjects fired a .45 caliber pistol and a .38 caliber pistol at four different task sequences using each weapon. A total of 256 data points was collected. The results of the research and analysis showed there was no statistical difference between the weapons used as far as handling characteristics were concerned. The index of difficulty measurement of the tasks was shown to have a high correlation to the times required by each weapon to perform the tasks that had one or more movements specifically designed into the tasks.

Master of Science in
Operations Research
September 1975

Advisor: James K. Arima
Operations Research
and Administrative
Sciences Department

Predicting Aircraft Equipment
Removals During Initial Provisioning Period

Edwin August Fincke
Lieutenant Commander, United States Navy
B.A., Colgate University, 1961

An investigation was made into the characteristics of program elements and removals of Weapon Replaceable Assemblies aggregated at the system level for the purpose of developing a method to predict removals during initial provisioning periods. From examination of nine avionic systems over a 28 month period a binomial model was developed using a removal rate based on aircraft-months as a program element.

The model is to be used before Fleet data are generated by obtaining aircraft-month estimates from the contractor and removal rate estimates from similar operational equipments. A probability distribution reflecting the degree of certainty is selected as a prior estimate. Then, as Fleet experience is accumulated the distribution is updated using Bavesian techniques and maturity growth curves. This distribution is used to give an estimate of current removal rate and to extrapolate to future removal rates.

Master of Science in
Operations Research
September 1975

Advisor: F. R. Richards
Department of Operations
Research and Adminis-
trative Sciences

An Approach To Point of Sale
System Acquisition Cost-Benefit
Analysis

James Alexander Fleming, Jr.
Lieutenant Commander, Supply Corps, United States Navy
B.S., United States Naval Academy, 1962

Point of Sale (POS) Systems introduced into the retail and supermarket industries exemplify a change which is occurring in all data collection. Initial Department of Defense utilization of POS Systems is occurring in commissaries and exchanges, military counterparts of the supermarket and retail industries respectively. The purpose of a POS System is to automate the point of sale by replacing the electro-mechanical cash register with an electronic cash register (ECR) capable of some degree of interaction with the computer.

This thesis summarizes the diffuse literature on POS Systems through discussion of POS System development, components and configurations, and proposes a general cost-benefit model to assist in the POS System acquisition decision.

Master of Science in
Operations Research
September 1975

Advisor: F. R. Richards
Operations Research and
Administrative Sciences
Department

Predicting Performance in Advanced
Radar Intercept Officer (RIO) Training

Scott Charles Follett
Lieutenant Commander, United States Navy
B.A., University of Texas, 1965

The high attrition rate in Naval Flight Officer (NFO) training has been the subject of much concern and attention for some time. Of particular concern is the exceedingly high attrition rate in Radar Intercept Officer (RIO) training. The present prediction system is based on a linear regression technique of academic and flight variables. This thesis attempts to improve on the current prediction methods by updating the variables used, adding variables based on students personality traits and exploring the possibility of employing the logistic function as the prediction technique.

Master of Science in
Operations Research
March 1976

(
Advisors: Douglas E. Neil
Lewis E. Waldeisen
Operations Research &
Administrative Sciences
Department

Equilibrium Analysis of Effects
of a Price Change of an Input Factor
in the Context of Input-Output System

Clodualdo R. Francisco
Lieutenant, Philippine Navy
B.S., Philippine Military Academy, 1967

This paper is an attempt to model the effects of price change of a primary input factor into a segment of an economy. The primary input factor referred to is petroleum and the segment of the economy, the energy sectors. Labor is considered as another primary input factor.

Market equilibrium is assumed to be stable and the disturbance caused by a price change in a primary input factor results in a new equilibrium state. Three approaches are made to define or specify this new state of equilibrium. Input-output economics is the primary basis of all three approaches. Having analyzed and defined the new equilibrium state gave results that could serve as bases in making policy measures relative to the nature of the disturbance.

Master of Science in
Operations Research
September 1975

Thesis Advisor: P.M. Carrick
Operations Research and
Administrative Sciences
Department

Markovian Queues With
Arrival Dependence

Jack Burton Gafford
Captain, United States Army
B.S., United States Military Academy, 1969

A study of three Markovian queues wherein customers require two separate types of service upon arrival. The two service channels operate independently but receive demands through a common arrival process. Transient and steady state results are established in the case that the service channels have an infinite number of servers. The remaining two systems, finite server and finite capacity, are not completely modeled. However, special results concerning their stochastic nature are documented.

Master of Science in
Operations Research
March 1976

Advisor: Donald P. Gaver
Department of Operations
Research and Administrative
Sciences

Composition of Material Price Indices for
Naval Ship Contract Escalation

Donald David Geismar
Lieutenant, United States Navy
B.S., United States Naval Academy, 1967

The weightings of the elements in the Naval Sea Systems Command's material escalation index, the BLS Material Index for Steel Vessels (BLS), are compared with estimates of the material composition developed through the analysis of detailed cost estimates for the DD963 and the LHA. In addition, a comparable prediction of the composition of the LHA is made from the composition of the DD963. Unique composite indices for five ship types are obtained using percentages by the Navy cost groups from the DD963 analysis. These demonstrate the existence of a range of weightings which are dependent upon the ship type. The escalation payments using both the BLS and the index representative of the unique material composition are calculated for the DD963. Comparison shows that substantial overpayment occurs when using the BLS. Under other economic conditions underpayment might occur. It is recommended that NAVSEA investigate an administrative procedure to develop unique material composite indices for each ship type for use in contract escalation provisions.

Master of Science in
Operations Research
September 1975

Advisor: Michael G. Sovereign
Operations Research
and Administrative
Sciences Department

A Deterministic Two-Echelon Inventory Model
with an Arbitrary Number
of Lower Echelon Activities

Ardin Francis Goss
Lieutenant, Supply Corps, United States Navy
B.S., University of Michigan, 1969

The Economic Order Quantity (EOQ) model is extended to a deterministic, two-echelon model with an arbitrary number of activities on the lower echelon. Two variations of the model are developed using minimization of time-average cost as an objective. A no-stockouts-allowed case is examined, and a method for finding the optimal solution is developed. A backorders-allowed model is derived and partially solved here in general. A full solution is presented for a restricted range of lower echelon parameter values. Examples of the no-stockouts-allowed model are given and solved. The solutions from this model are compared to those derived assuming the activities operate wholly independently. Significant potential reduction in variable time-average cost through the use of this model is demonstrated.

Master of Science in
Operations Research
March 1976

Advisor: Alan W. McMasters
Operations Research and
Administrative Sciences
Department

The Effect of Alcohol Ingestion
on
Short Term Memory and Attention

Christopher Michael Grauert
Lieutenant, United States Navy
B.S. Mathematics, Fairfield University, 1968

Using a serial short term memory task, subjects were required to respond to stimuli presented one-back, two-back, and three-back from a random sequence of four different symbols before alcohol ingestion, after alcohol ingestion and again after alcohol with motivation. The purpose of the experiment was to determine whether alcohol had an adverse effect on Short Term Memory and, once intoxicated, whether the degradation of Short Term Memory could be overcome by attention. Analysis of the data collected from 10 subjects showed that alcohol adversely affected Short Term Memory in all three delay modes, while motivation had no effect in overcoming this Short Term Memory degradation due to alcohol ingestion.

Master of Science in
Operations Research
September 1975

Advisor: Douglas E. Neil
Department of Operations
Research and Administrative Sciences

Alternate Calculations for Learning

Curve Slopes of Fighter Aircraft

Chun Po Han

Captain, Chinese Air Force

B.S., Chung Ching Institution of Technology, 1970

For the implementation of system analysis as an aid to decision making, cost quantity relationships of airframes are important. Various types of learning curves were introduced in this study. Data was obtained from the Aircraft Cost Handbook for seventeen fighters. The statistical methods used were log linear regression and the jackknife procedure. Results of both methods are compared. In general, within this study, the method of jackknife shows more learning than log-linear regression and the hand-fitted curves of the Aircraft Cost Handbook. The slopes of the learning curves of seventeen fighters are given.

Master of Science in
Operations Research
March 1976

Advisor: Michael G. Sovereign
Dept. of Operations
Research & Administrative Sciences

STOCHASTIC DECISION MODEL FOR ARITHMETIC PROGRAMMING

MOHAMMAD ZIA UL HAQUE

FLIGHT LIEUTENANT, PAKISTAN AIR FORCE

B.E. (AERONAUTICAL), UNIVERSITY OF KARACHI, 1970

FEW IF ANY VALIDATED GUIDELINES EXIST FOR MAKING DECISIONS ABOUT THE DESIGN, MEDIA, OR FORMAT OF NEW INSTRUCTIONAL PRODUCTS. THIS STUDY EXAMINED STRINGS OF PROGRAMMED LEARNING RESPONSES TO CREATE GENERAL GUIDELINES FOR MAKING SUCH DECISIONS. USING A MARKOV MODEL, TABLES WERE DEVELOPED RELATING THE EXPECTED PROPORTION OF STUDENTS TO BE IN A SOLUTION STATE AT A GIVEN ACCURACY LEVEL AND AT A GIVEN LEVEL OF CONFIDENCE WITH RESPECT TO THE LENGTH OF RESPONSE STRINGS.

MASTER OF SCIENCE IN
OPERATIONS RESEARCH
MARCH 1976

ADVISOR: JAMES K. ARIMA
DEPARTMENT OF
OPERATIONS ANALYSIS

Regional and Inter-Regional
Input-Output Model as a Planning Tool
for Economic Development in Indonesia

Khairul Hasan
Lieutenant, Indonesian Navy
Popov Naval Academy, Leningrad, USSR, 1967

Conspicuous inter-regional differences exist in population density and personal incomes in Indonesia. The future success of economic development in Indonesia requires the identification of some alternatives to the heavy concentration of the population on the island of Java.

This paper investigates the applicability of regional and inter-regional input-output models as a planning tool for guiding regional economic development. An inter-regional input-output model is developed which will, if implemented, allow regional economic planning to be accomplished in a consistent manner. It will permit a central planning office to coordinate the choices of the regional planning officials so that these will support national economic development.

Master of Science in
Operations Research
June 1976

Thesis Advisor: P. M. Carrick
Operations Research and
Administrative Sciences
Department

A Development and Comparative Analysis
of Two Models for Air Defense Gun
System Burst Kill Probability

David Kenneth Heebner
Captain, United States Army
B.S., Worcester Polytechnic Institute, 1967

This study describes two models for the computation of burst kill probabilities for air defense gun systems firing non-fragmenting projectiles at non-maneuvering aircraft targets. Model I was suggested for U. S. Army use by Braddock, Dunn and McDonald, Inc. and is currently used in the TACOS II air defense battle simulation. Model II was developed by the Systems Analysis Directorate, HQ, U. S. Army Weapons Command for use in gun system engineering development. The models are contrasted in development to demonstrate the strengths, weaknesses and relative merits of each. The Weapons Command model appeared to be based on a less restrictive set of assumptions than the BDM model, but sample results showed near equivalence in model BKP values throughout a reasonable range of engagement conditions.

Master of Science in
Operations Research
March 1976

Advisor: S. H. Parry
Department of Operations
Research and Administrative
Sciences

Analysis of the U.S. Amphibious Response in the Mid-Range
(1980-1985) (U)

Bruce Edward Holdt
Lieutenant, United States Navy
B.S., University of Washington, 1968

The objective of this study was to evaluate the U.S. amphibious force's contributions to the concept of NATO general purpose force deterrence. In particular, the response time and amphibious lift capability of the U.S. Naval Amphibious Force were determined for the 1980-85 time frame. First, the study describes the amphibious force lift requirements and the naval force lift capabilities. The amphibious force response is determined through a time and distance analysis and a lift or embarkation capability analysis. A sensitivity analysis was also conducted by examining several of the study's basic assumptions. Finally, any shortfalls or delays are discussed, and recommendations are offered to eliminate or minimize them. It was determined that the amphibious force response would be satisfied with existing or planned assets if the study's recommendations are implemented.

Master of Science in
Operations Research

March 1976

Advisor: M.G. Sovereign
Department of
Operations Research

Investigation and Evaluation of a
Zero Input Tracking Analyzer (ZITA)

Ronald Edward James
Lieutenant Commander, United States Navy
B.A., University of Tennessee, 1971

This study was designed to evaluate a psychomotor testing instrument known as the ZITA (Zero Input Tracking Analyzer). This instrument was being considered as a prediction device in the selection of applicants for the U. S. Navy aircrew training program. Analysis of the data obtained from six subjects (all U. S. Navy pilots) over 26 hours of testing, showed the machine capable of consistent results in distinguishing between subjects with respect to this particular psychomotor task. A major disadvantage of the ZITA that became apparent was the amount of time (approximately 2 hours) required before learning curves were leveled out and the rate at which different individuals develop their learning curve.

Master of Science in
Operations Research
March 1976

Advisor: G. K. Poock
Department of Operations
Analysis and Administrative
Sciences

An Investigation of the Properties
of the
Exponential Moving Average Point Process

Lo, Tzy-dah Jathro
Commander, Chinese Navy
B.S., Chinese Naval Academy, 1959
M.S., University of Iowa, U.S. 1971

Properties of a stationary sequence of random variables $\{X_i\}$ which have exponential marginal distributions and random linear combinations of order one of an i.i.d. exponential sequence $\{\varepsilon_i\}$ were discussed by Lawrance and Lewis (1976); they called this model the EMAl (exponential moving average of order one) point process. This paper will investigate the estimators of the parameter β of the EMAl process, and some basic properties of the EMA2 process, and then extend these results to the EMAk process.

Master of Science in
Operations Research
March 1976

Advisor: Peter A. W. Lewis
Department of
Operations Research

A Method of Determining Estimable Functions
and
Testable Hypotheses in Experimental Design

John Earl Johnson
Captain, United States Army
B.S., University of Southern Mississippi, 1967

Applications of the general linear model in experimental design and analysis usually involve design matrices of less than full column rank. This may present a problem in determining what elements and functions of the parameter vector are estimable and what hypotheses are testable. This thesis discusses two methods of answering questions about estimability and testability, where the form of the design matrix determines the method to be used. The two methods, both of which can use computer routines, are: (1) direct mathematical computational approach, and (2) a modification of an analysis of variance routine, with a special case of this method using a modified ANOVA routine and solutions to systems of linear equations. Confounding of effects is developed mathematically in connection with determining estimable functions. Methods discussed in this thesis can be applied to the area of Army Test and Evaluation.

Master of Science in
Operations Research
March 1976

Advisor: Donald R. Barr
Department of Operations
Research and Administrative
Sciences

MANPOWER STOCKS AND FLOWS
IN A
RANK-STRUCTURED HIERARCHY

JAE CHANG KIM
Lt.Col, Republic of Korea Army
B.S., Korean Military Academy, 1962

Manpower problems of an organization have long been of great concern not only for prediction of the future personnel inventory at different ranks but also for analysing the interaction between states of ranks and indicating chances for promotion. This study is intended to construct and investigate reasonable and tractable models for manpower.

That is, models that describe the dynamics of recruitment, advancement, and separation of individuals in a rank-structured system. It is tempting to devise approximate diffusion models for such problems, in order to obtain simple analytical mathematical expressions for quantities of interest.

Master of Science in
Operations Research
March 1976

Advisor: D. P. Gaver
Operations
Research
Department

Information Processing
and Subjective Fatigue Level
as Indicators of Biorhythm Theory

Michael Dan Kiniry
Lieutenant, United States Navy
B.A., University of California at Irvine, 1967

This thesis investigates information processing rates and subjective fatigue level measurements as possible indicators of biorhythmic periodicity. The results did not support the theory in that a significant relationship was not observed between the predicted periodicity and the measures used here. These findings were interpreted as suggesting that, assuming the theory is valid, the measures were insensitive to the hypothesized fluctuations, or that the theoretical periodicity is not as precise as suggested by the theory of biorhythms.

Master of Science in
Operations Research
September 1975

Thesis Advisor: D. E. Neil
Operations Research and
Administrative Sciences
Department

The Effect of Complex Information
Processing Techniques Applied to
Short Term Memory of Military Officers

Kenneth Cameron Kodalen
Lieutenant Commander, United States Navy
B.A., College of Great Falls, 1964

The information processing rate is an important indicant of how well a naval systems operator will perform a complex task. The complex task used for this experiment was a highly sophisticated psychomotor-testing instrument designed to provide sensitive, reliable measurement of response speed, accuracy and short term memory which incorporated four delay modes.

Analysis of the data collected from twenty subjects showed that as the mental functions of the task became more complex, then more information was processed. The additional increase of information was not detected using simple information processing techniques.

These results supported the previous findings of Van Gigch who initially approached the problem.

Master of Science in
Operations Research
September 1975

Advisor: Gary K. Poock
Operations Research and
Administrative Sciences
Department

The Effect of Breathing 100 Percent Oxygen
on
Short-Term Memory of Military Officers
While Under Heat Stress

Robert Louis Krubsack
Lieutenant, United States Navy
B.A., University of Oregon, 1967

Using a serial short term memory task, subjects were required to respond to symbols presented one-back, two-back, and three-back from a randomly presented list of four different symbols while breathing either 100 percent oxygen or atmospheric air with an oxygen mask in a heat stressful environment. The purpose of the experiment was to determine if breathing 100 percent oxygen had any effect on the short term memory of a subject under heat stress. Analysis of the data collected from 10 subjects under heat stress indicated breathing pure oxygen had no effect in the 15 minute period on short term memory.

Master of Science in
Operations Research
September 1975

Advisor: Gary K. Poock
Department of Operations
Research and Adminis-
trative Sciences

Theory and Testing of Uniform
Random Number Generators

Gerard Paul Learmonth
B.S., New York University, 1966

Two structural tests for random number generators of the Lehmer congruential type are discussed. They are known now to be essentially equivalent but are formulated incorrectly and the computational algorithms to implement the tests are unnecessarily complicated. New algorithms for these tests will be sketched.

Master of Science in
Operations Research
June 1976

Thesis Advisor: P.A.W. Lewis
Operations Research
and Administrative
Sciences Department

A Multi-Resource Leveling Algorithm
for Project Networks

ChungUng Lee
Major, Korean Army
B.S., Korean Military Academy, 1964

This thesis presents a modification and extension to the Burgess and Killebrew heuristic resource leveling procedure for project networks. In contrast to previous algorithms appearing in the literature, the objective function of this algorithm is the minimization of the sum of the squared errors in each time period (deviations around the mean usage) of all resources over the duration of the project. The objective function continues the search for an improved schedule beyond that of previous algorithms with their associated objective functions. One important feature is that the algorithm tends to reduce the number of periods that a resource is idle during its duration on the project.

Master of Science in
Operations Research
September 1975

Advisor: Alan W. McMasters
Operations Research
and Administrative
Sciences Department

An Investigation of the Probability Distribution
of the
Ridge Regression Estimator for Linear Models

Edgar Barry Lewis
Lieutenant, United States Navy
B.S.E.E., University of New Mexico, 1967

The estimation of the parameters of a linear statistical model is generally accomplished by the method of least squares. However, when the method of least squares is applied to nonorthogonal problems the resulting estimates may be significantly different from the true parameters. The method of ridge regression may provide better estimates in these cases; however, a probability distribution of the ridge estimator is presently not known. The form of such a distribution is dependent upon how the ridge parameter, k , is selected. Two possible objective methods of choosing k are examined to determine if either one leads to a useful probability distribution.

Master of Science in
Operations Research
March 1976

Advisor: Harold J. Larson
Operations Research and
Administrative Sciences
Department

Two Space-Constrained Multi-Item
Deterministic Inventory Models

Klaus Lieding
Captain, Federal German Army
Betriebswirt (grad), FHS I of the Army, 1970

This paper presents two types of multi-item deterministic constrained inventory models which relate to the constraints of the equivalent of a direct support unit in the Federal German Army; namely, that there is only a limited amount of space available for storage of items. One is a continuous review model with no stockouts allowed and the other is a periodic review model where backorders are allowed. In contrast to previous models analyzed by Naddor and others, time phasing of the arrivals of orders of different items is allowed. The benefit derived from this phasing is the reduction in the average amounts of on-hand inventory and backorders. Solutions are obtained for the two-item case and the n-item case is discussed. Examples illustrate the results.

Master of Science in
Operations Research
September 1975

Thesis Advisor: A.W. McMasters
Operations Research and
Administrative Sciences
Department

EFFICIENCY INDICATORS FOR EDUCATION AND TRAINING

Norbert Lukasczyk
Lieutenant-Commander Federal German Navy
M.S. Naval Postgraduate School 1974

The indicators Staff Student Ratio, Cost per Student per Unit Time, and Cost per Graduate are discussed with emphasis on the analysis of their properties for the use as indicators for CNET to monitor efficiency of the training establishment both overall, and at different levels. The arguments show that the cost per graduate is the most appropriate indicator for a single course. Methods are derived to determine appropriate methods of aggregation for multiple courses. The derived indicators have the mathematical form of the Laspeyres and Paasch indicators, used in economic theory for the cost of living index. They are applied to 60 courses of SSC San Diego and compared to indicators determined by linear regression based on the same data set. The indicators are also applied for different groupings of courses, and different accounting systems. The resulting values of the indicators are helpful to locate the area of interest and detail for further decision making.

Master of Science in
Operation Research
June 1976

Advisor: K.T. Marshall
Operation Research
Department

Development of an Aggregated
Lanchester-Type Combat Model for the Evaluation
of Air-War Allocation Strategies in a Theater Sector

Robert Alan Martray
Captain, United States Army
B.S., United States Military Academy, 1969

This thesis develops a Lanchester-type model of air/ground combat operations in order to evaluate strategies for allocating aircraft to various missions (e.g., air base attack, close air support, logistics interdiction, etc.). The model includes air strengths and air allocations, and it relates these factors to a measure of combat effectiveness. This system evaluation criterion is a linear function of FEBA movement and casualty ratio. The planning horizon for evaluating aircraft allocations is determined by a campaign termination model that stops the battle under any of the following conditions:

1. time exceeds a predesignated limit,
2. FEBA movement exceeds a predesignated limit,
3. either force level reaches a predetermined breakpoint.

The model is developed and exercised with hypothetical data, and the model output is interpreted.

Master of Science in
Operations Research
June 1976

Advisor: James G. Taylor
Operations Research and
Administrative Sciences
Department

Analysis of the Variable Behavior Manifested
in All Navy/Marine Major Aircraft Accident Rates

John Scott Maxwell
Lieutenant, United States Navy
B.A., Purdue University, 1966

and

Laurence Valdimir Stucki
Lieutenant Commander, United States Navy
B.A., Harvard College, 1963

All Navy/Marine monthly aircraft accident rates exhibit a behavior of marked variability which cannot be attributed solely to weather or other natural phenomena. Variable measures construed as time dependent were obtained for all major accidents between July 1968 and June 1974. Stepwise linear multiple regression studies relating the variables to accident rate showed pilot age, daylight pilot flight hours for the 90 days preceding the accident, the number of night carrier landings in the previous 30 days, and the number of daylight carrier landings in the previous 30 days explained 46.65% of noted accident rate variance. The results corroborate previously held theories that pilot error is the single largest causal factor in aircraft accidents.

Master of Science in
Operations Research
September 1975

Advisor: Gary K. Poock
Operations Research
and Administrative
Sciences Department

An Approach to the Estimation of Life Cycle
Costs of a Fiber-Optic Application in Military Aircraft

John Michael McGrath
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1962

Kenneth Ralph Michna
Lieutenant Commander, United States Navy
A.B., Wabash College, 1965

As significant technological advances in fiber optics and optical data transmission methods are being made, it is necessary to develop appropriate methods for estimating life cycle costs for alternative coaxial/twisted pair wire and optical fiber avionics. Measures of effectiveness are suggested for each alternative system. An approach, which structures the technological and demand uncertainties of fiber optics, is developed through scenarios as a means of relating cost and effectiveness. It is suggested that Delphi and experience curve techniques be used in conjunction with ordered scenarios as a technological forecasting technique for estimation of life cycle costs of fiber optics. In addition, a review of the historical and technological background of fiber optics and their application to the Naval Electronics Laboratory Center (NELC) A-7 Airborne Light Optical Fiber Technology (ALOFT) Program is included.

Masters of Science in
Management
Operations Research
September 1975

Advisor: Carl R. Jones
Operations Research
and Administrative
Sciences Department

Harpoon Missile Airborne Command and
Launch System Availability Model

Julian LaFayette Moon, III
Lieutenant, United States Navy
B.S.I.E., University of Illinois, 1968
B.S.M.E., University of Illinois, 1975

Two models are developed for calculating the availability of the Harpoon Missile airborne command and launch system (HACLS). The first model is a semi-Markov process. Its assumptions are validated using the subsequently developed computer simulation model. Both models are exercised with parametric variations, the critical parameters being mean time to failure, mean time to repair, and severity of the operating environment. Less critical parameters are maintenance efficiency and, for the simulation only, maintenance time to repair probability distribution. A major discovery in this paper is that the standard definition of availability does not prove to be adequate when used to determine system availability in a complex framework of operations.

Master of Science in
Operations Research
September, 1975

Advisor: Gerald G. Brown
Operations Research
and Administrative
Sciences Department

Social Cost of Oil Pollution

Hanny Susmono Mudjiardjo

Major, Indonesian Army

Electrical Engineer, Bandung Institute of Technology, 1965

The purpose of this thesis is to investigate a method of improving decision making relative to the problems created by oil spillage. Many countries around the world, including Indonesia, are plagued by increasing pollution from these spills.

This thesis uses a simulation to consider the spread and damage caused by oil spills using data from San Francisco Bay. A projection of social costs from these spills has been made.

Formulation of a methodology for deriving the social cost of oil spills is a prerequisite in reaching optimal, rational decisions in managing oil pollution. Such decisions may include the establishment of a fine structure, determination of the required level of clean-up and identification of socially significant spills.

Parameterization of Terrain
in Army Combat Analysis

Christopher James Needels
Major, United States Army
B. S., United States Military Academy, 1965

This study presents and evaluates a methodology for parameterizing terrain for use in land combat analysis. The current procedure is to use digitized data which is compiled from actual terrain by engineer surveys and photo-interpretation. However, for those studies which do not require exact representation of terrain, a less costly and time consuming method can be used. In particular, terrain can be created mathematically by using a modified bivariate normal probability density function. An additional advantage of this approach is that the macro-terrain features can be created at random, thereby providing multiple, unique realizations of a type of terrain. This capability overcomes the sensitivity of Army study results to a single sample of terrain. When used for line-of-sight calculations, the parameterized, continuous representation eliminates the need for interpolations required for digitized terrain. The methodology and simulation can be employed independently or used as a preprocessor for other combat models.

Master of Science in
Operations Research
March 1976

Advisor: Samuel H. Parry
Department of
Operations Research
and Administrative
Sciences

An Operations Research Model
of a Health Care Appointment System

Robert Stanley Nemmers
Lieutenant Commander, Supply Corps
United States Navy
B.S., North Carolina State University, 1963

This study models a clinic at Silas D. Hays Hospital, Fort Ord, California. The purpose is to propose a means of scheduling appointments in a clinic. Estimates of parameters of the model were made, inputs and outputs of the model were calculated and a sensitivity analysis was performed. Finally, conclusions were stated.

Master of Science in
Operations Research
September 1975

Advisor: R.W. Butterworth
Operations Research
and Administrative
Sciences
Department

An Analysis of Response Distributions
from Three Different Etiological Groups
of Educationally Handicapped Learners

Wolfgang W. Oertel
Lieutenant Commander, Federal German Navy

In the area of special education there are two different approaches towards training: The differential diagnosis approach states that etiological characteristics affect prognosis for training and the behavioral approach asserts that the results of training are independent of etiological factors. To obtain more evidence regarding these positions, the response distributions of three groups of language-handicapped children with different etiologies were analyzed using the Markovian learning model as a tool. The learning task was a remedial language program created by the Behavioral Sciences Institute, Carmel, California. No differences were found in the learning patterns of these groups. Rather, a positive relationship supporting the behavioral viewpoint was found to exist.

Master of Science in
Operations Research
September 1975

Advisor: J. K. Arima
Operations Research
and Administrative
Sciences Department

Evaluation of Human Encoding Performance With
Varied Display Media

Michael Joseph O'Keefe
Lieutenant, United States Navy
B.A., San Diego State College, 1969

The experiment measured the time within three milliseconds accuracy, required for a complex systems operator to encode information commonly presented by systems hardware displays. The categories of parameters to be researched included the following: symbology, size of font, numbers, letters, colors, words, orientation of pointers, and speed of eye movement. The data is required to enhance the capability of Hardware/Systems Simulation of current interest to the Naval Air Development Center. Twenty Naval Aviation officers were used in an Order-Free Latin Square design. Encoding times for individual variables were from .092 second for single numbers to .942 second for four letter words.

Master of Science in
Operations Research
June 1976

Advisors: L. E. Waldeisen
D. E. Neil
Department of Operations
Research & Administrative
Sciences

A Computer Model to Assess Financing
Provisions of Naval FPIF Shipbuilding Contracts

Stephen Robert Olson
Lieutenant, United States Navy
B. S., United States Naval Academy, 1967

The complexity of a Fixed Price Incentive Fee (FPIF) contract indicates the need for a quantitative approach in evaluating the impact of FPIF Financing provisions on both the Navy and the contractor. While total program costs may be the most important financial consideration to the Navy, the contractor is affected both by profit and the timing of reimbursement by the government. The timing is an especially important consideration in view of the long construction periods inherent in U.S. Navy ship construction.

This paper presents an FPIF contract financing simulation model to evaluate various progress and escalation payment alternatives, progress curves and learning curves. It calculates the impact of cost growth, schedule overrun, and escalation index performance. The model is documented *for use by others.*

A discussion of two applications of the model is included. Two escalation payment alternatives were evaluated for the CVN-70. Various thresholds for progress payments were studied for the FFG-7. From experience with these applications it was concluded that a detailed model of this type is necessary for evaluating FPIF contract provisions.

Master of Science in
Operations Research
September 1975

Advisor: M. G. Sovereign
Department of Operations
Research and Administrative
Sciences

Mathematical Model for Small Arms Fire
Against Low-Flying Aircraft

Purwo A. Padua
Major, Indonesian Army

Mathematical models for hit probabilities of small arms fire against low-flying aircraft are developed with the aid of the impact points. Three techniques of fire are examined. A model for determining appropriate lead angles is developed. Probability of hit for single shot at various ranges and constant altitude are calculated. Repeated shots are then examined when the technique is used of firing multiple rounds at a fixed angle. The result shows the probability of one of the shots is high, while for other rounds it declines very sharply. Suggestions for further extensions are included.

Master of Science in
Operations Research
March 1976

Advisor: Joseph B. Tysver
Operations Research
Department

A Manning and Maintenance Effectiveness Model
Applied to
the Communication Division
of a
"KNOX" Class Destroyer Escort

Clifford Stephen Perrin
Lieutenant, United States Navy
B.A., Baldwin Wallace College, 1966

The study objective was to investigate the problems of ship manning effectiveness, specifically in the maintenance and repair areas, using various probabilistic modeling and data analytical techniques of operations research. Maintenance and Material Management data from the Maintenance Data Collection System were used for estimating failure rates, repair rates and maintenance deferral rates for each type of equipment. These rates were then used as inputs to the mathematical models. The models could then predict system availability which depends on manning level and the rate of repairs deferred for various reasons.

Master of Science in
Operations Research
September 1975

Advisor: Donald P. Gaver
Operations Research and
Administrative Sciences

A Preliminary Analysis of the Visit Rates
of Patients in a Military Family Practice
Health Care Program

Frank Marchman Perry
Captain, United States Army
B.S., United States Military Academy, 1967

This thesis provides a preliminary analysis of the visit rates of patients in a military family practice mode of health care. The history and basic operations of a family practice clinic at Fort Ord, California are briefly discussed. The process and problems of the sample selection and data collection are explained in detail. The analysis procedures are described fully. Comparisons of clinic utilization are accomplished and confidence intervals for the average visit rates are calculated. Visit rates to clinic groups (family practice, primary, and specialty) are discussed. Family practice referral patterns are analyzed. The sample is subdivided into Age/Sex groups and into Grade/Military Status groups. Conclusions and recommendations for future work are offered in the final section.

Master of Science in
Operations Research
September 1975

Advisor: Richard W. Butterworth
Operations Research and
Administrative Science

Maintenance Manpower Reallocation
Assessed by
Stochastic Models

James Arthur Phelan
Lieutenant, United States Navy
B.S.E.E., Purdue University, 1967

Three models of an aircraft repair facility are developed for use in computing manpower savings achievable by scaling-up aircraft maintenance shops. One model is a bivariate Markov process model requiring a Gauss-Seidel iterative algorithm for its solution. The other two are the simple Repairman problem and the M/M/S queue, the solutions to which can be found in most introductory texts on stochastic models. The simple models are compared to the more refined bivariate model in regard to predictive accuracy. The simple models are used to compute the manpower savings achievable in one scaling-up scheme, and predict a 20% savings in maintenance personnel.

Master of Science in
Operations Research
September 1975

Thesis Advisor: D. P. Gaver
Operations Research and
Administrative Sciences
Department

Evaluation of Vehicle Performance
in Coast Guard Search and Rescue Missions

Donnie David Polk
Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1966

and

James Edward Smith, Jr.
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1969

This study examines the problem of evaluating the capabilities of both conventional and high performance craft in the Search and Rescue mission. The methodology developed, if extended to include all missions, may serve as a decision aid in determining the resources to be utilized in the future by the Coast Guard. A model is constructed which evaluates the SAR potential of any vehicle type conditioned upon the design parameters of the craft. This study concentrated on specific high performance watercraft, conventional surface vessels, and the HH52-A Sikorsky helicopter. The results show that the helicopter outperforms all other resources in total SAR capability even though it is unable to render assistance in all SAR categories. Of the craft considered, the 82 foot WPB is shown to be the most cost-effective.

Master of Science in
Operations Research
September 1975

Thesis Advisor: M.G. Sovereign
Operations Research and
Administrative Sciences
Department

An Analysis of Field Artillery Unit Configurations
Employing Cannon Launched Guided Projectiles

Stephen John Pryplesh
Captain, United States Army
B.S., University of Virginia, 1969

Cannon launched guided projectiles (CLGP) are currently being evaluated in the materiel acquisition process. This new concept for the employment of field artillery is examined via the Dynamic Tactical Simulator (DYNTACS), a computer simulation model. Parametric variations in artillery unit organization are made to include the number of forward observers, the number of howitzers and batteries, and changes in the unit response time for fire missions. Dynamic measures of effectiveness are used to discriminate between unit configurations.

Master of Science in
Operations Research
September 1975

Advisor: S. A. Parry
Department of Operations
Research and Administrative Sciences

Human Factors in Night Watch-standing

Djodjok Rahardjo
Captain, Indonesian Navy
Indonesian Naval Academy, 1966

Indonesia consists of 13,000 islands and 2/3 out of the whole area consists of water. In order to have a good security coverage, a good Navy is required.

This present paper investigates what is a good Navy in terms of human factors and specifies them in the problem of how night watch-standing can be improved.

In examining the problem of night watch-standing, the present paper investigates the following variables:

1. sleep loss and awakening
2. fatigue and boredom
3. visual function
4. drug's effect
5. illumination

The recommendations and conclusions drawn are based on existing knowledge acquired from a review of the relevant literature and personal experiences with ships of the Indonesian Navy.

Master of Science in
Operations Research
September 1975

Advisor: D. E. Neil
Operations Research and
Administrative Sciences Department

Provisioning an Aircraft
Weapons System

Richard Bray Renner
Commander, Supply Corps, United States Navy
B.S., United States Naval Academy, 1957

This research reviews the elements and stages of the provisioning cycle and describes the provisioning model used by the United States Navy Aviation Supply Office to select a repair parts inventory for an operational site supporting a new aircraft weapons system. Using actual item data, a sensitivity analysis of important parameters was conducted. It showed that break-even points and minimal cost points could be determined for supply effectiveness goals, and that there is a direct effect of increases in resupply and repair times on IOL inventory.

Master of Science in
Operations Research
September 1975

Thesis Advisor: F.R. Richards
Operations Research and
Administrative Sciences
Department

The Effect of Continuous Noise
on
Short Term Memory Performance Tasks

Iver John Rivenes, III
Lieutenant, United States Navy
B.S. Purdue University, 1970

Naval officers routinely perform a number of tasks requiring short term memory under conditions of moderate background noise levels. The performance of 20 Navy officers on a serial short term memory task was analyzed under two levels of difficulty and two different sound levels. The purpose of the experiment was to determine whether moderate intensity, continuous noise had an effect on short term memory. Analysis of the data collected indicated that continuous noise at a sound level pressure of 85 dB (re .0002 dyne/cm²) had no effect on the subjects short term memory. Levels of difficulty resulted in a significant difference in performance on the serial short term memory task used in this experiment.

Master of Science in
Operations Research
September 1975

Advisor: L.E. Waldeisen
Operations Research and
Administrative Sciences
Department

An Investigation of the Applicability of the
Product Limit Estimate to the Statistical
Analysis of Sonar Detection Distributions

Ronald Arthur Route
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

The application of the product limit estimate (PL estimate) to the analysis of sonar detection range data was examined using an empirical approach. A sonar detection distribution was assumed to be known and target lateral range distributions corresponding to likely operational scenarios were derived. These distributions were used in a computer simulation to generate sample fleet exercise reconstruction data. For data of small sample sizes, the PL estimates of the sonar detection distribution were compared with the known distribution and were found to be reasonably accurate approximations for all tactical situations tested. The PL estimates clearly outperformed the more readily computable, yet always optimistic, reduced sample (or empirical survival function) estimates. Finally, confidence intervals about the estimate were computed by using the jackknife procedure and the apparent optimism of the resulting confidence intervals was noted. Confidence interval baseline data is provided for future comparison with results from the estimates generated from small sample sizes. Further research is indicated to improve the usefulness of the jackknife to this application.

Master of Science in
Operations Research
March 1976

Thesis Advisor: D.P. Gaver
Operations Research and
Administrative Sciences
Department

Strike Warfare Carrier Tactical Support Center
(CV-TSC) System Functional Requirements (U)

Howard Streeter Russell
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

This thesis specifies a baseline System Functional Requirements for the CV-TSC System and is a formal response to SOR 21-41. The first section of the thesis reviews the history of ASW as practiced by aircraft carriers to afford a better appreciation of the dramatic changes which will be brought about by introduction of the CV Concept. The past and current status of CV-TSC at NADC, the developing facility, is also discussed in this section. The next section of the thesis formally defines the operational objectives and system characteristics of CV-TSC. The third section is a detailed analysis of the Command and Control posture for the system. Three distinct configurations are derived and analyzed to determine which is the proper one to utilize for system design. The final section builds upon the selected configuration by describing in detail the mission functions and subsystem requirements of the CV-TSC. The thesis concludes with a thesis summary and specific recommendations to aid in the CV-TSC system redesign efforts.

Master of Science in
Operations Research

March 1976

Advisor: M. G. Sovereign
Operations Research
and Systems Analysis
Department

An Analysis of the Position Location
and
Reporting System's Performance Characteristics

Walter Woodrow Sevon Jr.
Captain, United States Marine Corps
B.A., Spring Arbor College, 1968

The variables which significantly affect accuracy in two position location and reporting systems are examined in this thesis. Some physical and mathematical characteristics of the two systems are described. A model is developed to evaluate system accuracy. The significant variables are identified using the techniques of Analysis of Variance and Stepwise Linear Regression on test data from the two systems.

Master of Science in
Operations Research
March 1976

Advisor: Donald R. Barr
Department of Operations
Research and Administra-
tive Sciences

The Asymptotic Efficiency of the Moment
Estimators for Gamma Distribution Parameters

Soeroso
Captain, Indonesian Air Force

The Maximum Likelihood Estimations for Gamma distribution parameters are asymptotically "best", in the sense that they are asymptotically unbiased and efficient (Rao Cramer lower bound is achieved). Unfortunately, they are hard to find (i.e. one must solve a two by two nonlinear system).

The method of moments is more convenient, but its asymptotic efficiency needs checking. This is done in this thesis.

Master of Science in
Operations Research
March 1976

Advisor: R. R. Read
Operations Research and
Administrative Sciences
Department

Optimal Evasive Trajectories of an
Isotropic Acoustic Radiator

Jay C. Stuart
Lieutenant, United States Navy
B.S., North Carolina State University, 1966

The effects of detection equipment integration time on the optimal evasive trajectory of an isotropic acoustic radiator are studied. The boundary cases of infinite and zero integration time are examined. The infinite integration time case is formulated as a control problem and a maximum principle solution is obtained. The results consist of advice as to the choice of control vectors. The zero integration time problem is formulated in ordinary differential equations and the results consist of control vector advice. The relative movement plots and control vectors of the two bounding cases are compared.

Master of Science in
Operations Research
September 1975

Advisor: Alan Washburn
Operations Research
and Administrative
Sciences Department

A Multi-Item Inventory Model
for
Combat Stores Ships

Charles Floyd Taylor, Jr.
Lieutenant, United States Navy
B.S., Stanford University, 1968

The inventory model currently used by Combat Stores Ships (AFS's) is described and criticized. A simplified procedure for treating essentiality is presented. A multi-item inventory model was developed which minimizes the expected value of essentiality-weighted units short, subject to a constraint on total investment. With only slight modification, the model can be made to minimize the expected value of essentiality-weighted requisitions short. In tests using actual AFS demand data, the proposed model was compared to the current model and found to be markedly superior; specifically, the model was much less expensive to operate (in terms of investment levels) for fixed levels of performance (in terms of essentiality-weighted units short and in terms of line item effectiveness). At the 95% line item effectiveness level, for example, the proposed model required less than one third the investment required by the current model. An important by-product of the analysis was the discovery that AFS inventory demand conforms closely to a mixed Bernoulli/exponential probability distribution.

Master of Science in
Operations Research
September 1975

Advisor: A. W. McMasters
Operations Research
and Administrative
Sciences

The Development of Planning, Programming
and
Budgeting System in the Royal Thai Armed Forces

Medhi Thiamthat
Lieutenant Commander, Royal Thai Navy
B. Acc., Chulalongkorn University, 1957
M. Acc., The University of Georgia, 1969

The Planning, Programming, and Budgeting System was developed to facilitate budgeting in terms of military forces and weapon systems instead of the resource categories of military personnel, procurement, operation and maintenance, research, and construction. Costs were to be decided for the lifetime of a system, not just for the budget year. The planning and programming phases of PPBS have enabled the Secretary of Defense to see major force and support issues and have helped him to make effectively his decision. The Thai Ministry of Defense has attempted in many ways to develop the Royal Thai Armed Forces PPBS by choosing the U. S. system as a model for development of the Thai system and adapting it to fit the Thai needs. Today, the RTARF PPBS progresses slowly and the system is still unable to be put into operation because of many barriers.

Master of Science in
Operations Research
September 1975

Advisor: William A. Campbell
John W. Creighton
Department of Operations
Research and Administrative
Sciences

Modelling, Transformations, and Scaling
Decisions in Constrained Optimization Problems

John Joseph Timar
Lieutenant, United States Navy
B.S., Lehigh University, 1968

This thesis investigates various modelling choices and modelling decisions that can be used by defense analysts when solving nonlinear optimization problems. A discussion is given of separable programming, goal programming, and linear fractional programming models, and a description of the manner by which they can be converted to equivalent linear programs. Transformations of variables recommended in the literature are tested on several well-known test problems using GRG and SUMT nonlinear programming codes. The sensitivity of the GRG code to scaling, rotation of coordinates, and translation of variables is examined. Transformations to obtain separability of variables and experiments using a diagonalization algorithm to transform quadratic expressions into sums of squares are discussed. Barrier and penalty function transformations are also considered.

Master of Science in
Operations Research
March, 1976

Advisor: G.H. Bradley
Department of
Operations Research

An Investigation of the Relative Effectiveness
of the Personalized System of Instruction at
the Naval Postgraduate School

Patrick Alan Toffler
Captain, United States Army
B.S., United States Military Academy, 1968

An extensive and scientifically controlled experiment was designed and conducted over a three month period. The analysis of the results are accomplished with modern, advanced statistical procedures. The effort leads to the conclusion that the Personalized System of Instruction (PSI) is demonstrably superior to the conventional lecture/recitation (CLR) technique for teaching graduate level students (at NPS in a certain class of subjects). This paper describes in detail the nature of the experiment, the analysis and the benefits to be derived through utilization of PSI. The findings of this experiment are directly applicable to the costly and imperative educational and training missions conducted by the Department of Defense (DOD).

Master of Science in
Operations Research
September 1975

Advisor: Maurice D. Weir
Department of Operations
Research and Administrative
Sciences

An Analysis of the
Naval Personnel Pay Predictor
(Enlisted Model)

Allan Ray Walker
Lieutenant, United States Navy
B.S., University of Louisville, 1968
M.S., University of West Florida, 1970

The Naval Personnel Pay Predictor (Enlisted Model) is used by the Bureau of Naval Personnel as a tool for predicting the total annual basic pay for the enlisted force as an input to the budget process. A major source of error in the model was found to be the prediction of the length of service (LOS) vector, and an attempt to improve this prediction was made. The extreme complexity of the model was found to be unnecessary, and a simple exponential smoothing subroutine for LOS prediction did as well or better than the original model. It was also found that a double exponential smoothing subroutine, taking into account the trends in the force structure, would almost uniformly improve the one year prediction from the model.

Master of Science in
Operations Research
September 1975

Thesis Advisor: R.W. Butterworth
Operations Research and
Administrative Sciences
Department

An Evaluation and Comparison of
Three Nonlinear Programming Codes

Ralph John Waterman
Lieutenant, United States Navy
B.A., Columbia University, 1969

This study evaluates and compares the production use of three nonlinear programming codes. The three codes and their developers are: SUMT by W. C. Mylander, R.L. Holmes and G. P. McCormick, GRG by L. S. Lasdon, A. D. Waren, M. W. Ratner and A. Jain, and GRAVES by G. W. Graves. This is the first computer comparison of these three particular codes. Each code was evaluated with respect to the time and sophistication required of the user and the degree of mandatory or potential interaction between the code and the analyst. The comparison criteria were accuracy, robustness, efficiency and ease of utilization.

Eight current and realistic test problems employing from 9-100 variables and 2-20 constraints were used.

The results revealed that no single code was superior or inferior in all aspects. The choice of an optimal code among these three would be dependent upon the problems to be solved, the ability of the analyst and the desire of the analyst to alter the code for his own purposes.

Master of Science in
Operations Research
March 1976

Advisor: Gordon H. Bradley
Department of Operations Research
and Administrative Sciences

An Evaluation and Comparison of
Several Single Variable Search Methods

Daniel Brian Wick
Ensign, United States Navy
B.S., United States Naval Academy, 1975

This study compares three single variable search methods - Golden Section, cubic interpolation and quadratic interpolation. The SUMT nonlinear program was used for the comparison. The OPT subroutine which performs the single variable search in SUMT currently uses the Golden Section method. Two different OPT subroutines were written which implemented cubic interpolation and quadratic interpolation. Seven test problems which contained 9-100 variables and 2-20 constraints were used. The comparison was made on computation time per single variable search for the three methods and the number of function evaluations per single variable search for the Golden Section and quadratic interpolation methods.

A single variable search by Lasdon, Fox and Ratner and one by Fletcher and McCann were also discussed.

The results showed that the quadratic interpolation was slightly faster than the other two methods and required fewer function evaluations per single variable search than the Golden Section method. Time per single variable search was approximately the same for the cubic interpolation and Golden Section methods. Cubic interpolation required fewer points to be evaluated than the other two methods but the need for gradient evaluations proved to be costly in terms of computation time per single variable search.

Master of Science in
Operations Research
June 1976

Thesis Advisor: J. K. Hartman
Operations Research
Department

THE ESTIMATION OF LANCHESTER ATTRITION-RATE COEFFICIENTS
FOR AN AGGREGATED COMBAT MODEL

Lee, Yin-chu
Col, Rep. of China Air Force
M.B.A., Tamkang College, China, 1974

Pi, Yu-kung
Lt Col, Rep. of China Army
M.B.A., Tamkang College, China, 1974

This thesis considers the problem of estimating Lanchester attrition-rate coefficients for an aggregated Lanchester-type theater-level combat model, BALFRAM, which has been used for various high level defense planning purposes. Several alternative coefficient-estimation methodologies are examined, with their strengths, weaknesses, and problems of implementation in BALFRAM being discussed. Data requirements for coefficient estimation and approaches to aggregation are also discussed.

Master of Science in
Operations Research
June 1976

Advisor: James G. Taylor
OR and AS
Department

Laser Plasma Particle Velocities

Daniel James Callahan
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

Experiments were performed on laser produced plasma from aluminum target discs in a vacuum chamber at pressures a few times 10^{-6} torr. Plasma analysis was achieved using a floating double electrostatic probe of tungsten wires biased at -15 volts DC. In analyzing 376 oscilloscope trace pictures of the probe signal, four velocity signals occurred with regularity. The plasma velocities detected by the probe were determined to be 3.7×10^7 cm/sec, 1.5×10^7 cm/sec, 5.6×10^6 cm/sec (the bulk of the plasma), and 4.0×10^6 cm/sec. A fifth, very fast signal at 1.0×10^8 cm/sec was also detected, but it was not consistently present. Investigation of the velocity distribution as a function of time showed them not to be Boltzmann distributions but exponential power distributions.

Investigation of the crater formed by each laser pulse resulted in the determination of the following crater dimensions; crater depth 0.01 cm/shot, crater diameter of 0.11 cm and a total spot size diameter of 0.70 cm for the laser-target interaction.

Master of Science in
Physics
June 1976

Advisor: Fred R. Schwirzke
Physics and Chemistry
Department

Construction of a Deuterium Fluoride Laser

James Ballou Cook II
Lieutenant, United States Navy
B.S., United States Naval Academy, 1967

A small flowing gas chemical laser has been constructed for operation with hydrogen fluoride or deuterium fluoride as active medium for use in studies of optical propagation through the marine boundary layer. The laser uses longitudinal electric discharge dissociation of sulfur hexafluoride, with hydrogen or deuterium injection, to provide vibrationally-excited hydrogen fluoride or deuterium fluoride. The sulfur is removed in oxide form by reaction with oxygen in the flow, and self-relaxation is inhibited with helium as diluent gas. Single rotation-vibration transition selection is achieved with a blazed 300 line/mm diffraction grating as one reflector in an optical cavity perpendicular to the flow. Design considerations predict a cw output of approximately 1 watt multiline with DF, or 100 mW single-line, with electrical power input of approximately 4 kW.

Master of Science in
Physics
December 1975

Advisor: A. W. Cooper
Physics and Chemistry
Department

Electroexcitation
of Giant Resonances in ^{60}Ni
Between 5 MeV and 30 MeV
Excitation Energy

Dorse Howard DuBois II
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1961

and

George Macnider Bates
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

Giant multipole resonances and bound states above 6 MeV in ^{60}Ni were studied with inelastic scattering of electrons at 102 MeV incident energy and scattering angles of 60, 75, 90, and 105 degrees. In the energy interval from 5 MeV to 40 MeV excitation energy, ten states and resonances were observed of which only those below 7 MeV and those at 16.5 and 18.5 had been previously reported. Reduced transition probabilities were calculated, and multipolarity assignments were made. The ten transitions were observed at excitation energies of 6.1 (E3,E2), 7.0 (E3,M2), 7.6 (E2,E3,M2), 8.4 (E2,E0), 9.9 (E1), 11.8 (E2,E0), 12.9 (E3,M2), 15.0 (E4), 16.5 (E2,E0), and 18.5 (E1) MeV.

The E4 resonance at 15.0 MeV was previously unreported. The E2 resonance at 16.5 MeV reported in (α,α') work and the E1 resonance at 18.5 MeV from (γ,n) were confirmed.

Master of Science in
Physics
June 1976

Thesis Advisors: E.B. Dally
W.R. Pitthan
Physics and Chemistry
Department

A statistical Analysis of Emission-Line Stars
of the Orion Population

Joe Lee Frank III
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

A statistical analysis of the "Second Catalog of Emission-Line Stars of the Orion Population" was undertaken. After the reduction of the Catalog to numeric data, statistics and frequency distributions were systematically searched for any physically significant characteristics. Those two-way frequency distributions with possible physical significance were analyzed.

Distance moduli for 228 stars were tabulated. Hertzsprung-Russell diagrams were plotted. The T Tauri stars, so plotted, lie between the main sequence and giant branch. A lack of correlation between the large scale variability and any other set of observed characteristics was discovered. Present theories of stellar evolution do not explain this lack of correlation nor the cause of the variability. It is argued that, on the basis of current data, no conclusion can be reached as to whether T Tauri stars are on convective or radiative equilibrium tracks approaching the main sequence. A luminosity function for the Orion Population is presented and is found to be significantly different than the solar neighborhood luminosity function.

Master of Science in
Physics
December 1975

Advisor: William B. Zeleny
Department of
Physics and Chemistry

An Investigation of the Natural Line Shape
of the Giant Dipole Resonance

Edward Franklin Gordon
Lieutenant, United States Navy
B.S., University of Illinois, 1969

An investigation of photoabsorption experiments in the spherical nucleus ^{141}Pr , the quasispherical dynamically deformed ^{197}Au , and the statically deformed ^{165}Ho showed that the best function for the energy dependence of the reduced transition probability is given by the Breit-Wigner form rather than the Lorentz form of a resonance function. However, the form of the resulting measured cross section is of the Lorentz type. The dependence of the giant resonance width Γ on the excitation energy was also investigated. The variation was found to be less than 1% per MeV if one considered the known isovector E2 resonances above the giant dipole resonance. Best fit values of the reduced transition probabilities for the three nuclei are given and compared to (e, e') results.

Master of Science in
Physics
December 1975

Advisor: Rainer Pitthan
Physics and Chemistry
Department

Aperture Averaging Effects on Scintillation
and the Temporal-Frequency Power Spectrum

Howard Robert Hall
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

Aperture averaging effects on the measurement of scintillation and on the temporal-frequency power spectrum have been examined in the marine boundary surface layer using a He-Ne (6328 Å) laser beam propagating over various path lengths and under varying turbulence conditions. Two significant results have been obtained: (1) For scintillation measurements, a vanishingly small receiver can best be approximated by using an aperture of diameter $D_{\min} = (Z/k)^{1/2}$. (2) The aperture averaging correction factor for an aperture diameter $D > D_{\min}$ decreases as the level of turbulence increases.

Data have also been obtained supporting the theoretical prediction that an increase in aperture diameter reduces the high frequency power content of the temporal-frequency power spectrum.

Master of Science in
Physics
June 1976

Advisor: A. W. Cooper
Physics and Chemistry
Department

Examination of Laser-Produced Pressure
Pulses in a Gallium Arsenide Solar Cell

John Frank Jacobson
Lieutenant, United States Navy
B. A., University of Nebraska, 1970

Pressure pulses caused by irradiation of a model gallium arsenide solar cell with a Carbon Dioxide TEA Laser were examined using power densities of the order of 10^7 watts/cm². The pressure pulses were monitored with a Sandia type quartz pressure gauge. It was discovered that the relatively low power densities used were capable of removing the silicon dioxide antireflective and gold contact layers of the solar cell after only a few shots of the laser. An exponential relationship between the initial thicknesses of these layers and the pressure pulse generated in the gallium arsenide substrate was indicated for gold contact layers of less than 5000 Å thickness. Evidence was found that the principal pressure generation mechanism is thermomechanical. Gold films of thickness greater than 5000 Å were found to be able to absorb the power densities used with no apparent damage.

Master of Science in
Physics
June 1976

Advisor: A. W. Cooper
Physics and Chemistry
Department

Design and Construction of
an Iodine Laser Oscillator

Frederick Charles Marcell Jr.
Lieutenant, United States Navy
BSEE, University of Colorado, 1970

A small photochemical dissociation gas laser oscillator has been constructed for use in the study of laser characteristics, energy extraction techniques, and plasma production. It operates with a mixture of perfluorinated-propyliodide and argon as an active medium. The laser is pumped by ultraviolet light in a 500 \AA wide band centered around 2680 \AA . The light is produced by passing a large electric current through two parallel-mounted xenon-filled flashtubes, and causes excitation of the $\text{C}_3\text{F}_7\text{I}$ molecule which dissociates to a radical $[\text{C}_3\text{F}_7]$ and iodine $[\text{I}^*]$ in the state $\text{I}(^2\text{P}_{1/2})$. The resulting forbidden magnetic dipole transition $\text{I}(^2\text{P}_{1/2}) \rightarrow \text{I}(^2\text{P}_{3/2})$ produces laser action at wavelength $\lambda = 1.315 \text{ }\mu\text{m}$. The laser uses a hemiconfocal optical cavity. It consists of a spherical mirror with a radius of 1.5 m and reflectance of $\sim 98\%$ and a planar mirror with a reflectance of $\sim 75\%$ separated by $\sim 86 \text{ cm}$. Design considerations predict a pulsed output in the range of $1\text{-}10$ millijoules in a pulse length of $\sim 2\text{-}10 \text{ nsec}$ for a pumping energy of ~ 300 to 400 joules .

Master of Science in
Physics
June 1976

Advisor: Fred R. Schwaninger
Physics Department

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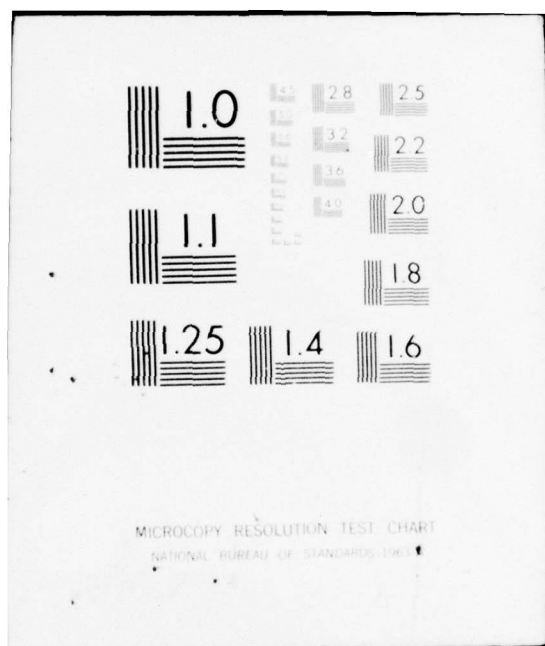
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Shipboard Measurements of 0.6328 Micrometer Laser
Beam Extinction in the Marine Boundary Layer

P. W. Parish
Lieutenant Commander, United States Navy
B.S., University of Nebraska, 1966

A method of measuring laser beam extinction in the atmosphere over the ocean has been devised and satisfactorily utilized. An attempt has been made to correlate the observed values with existing meteorological conditions. The apparatus consisted of equipment, already being utilized for scintillation measurements, modified by the addition of a source intensity monitor. Several calibration trials and three over-water experiments were conducted. A value on the order of 5×10^{-4} meters⁻¹ was found for the extinction coefficient in clear weather.

Master of Science in
Physics
June 1976

Advisor: G. W. Rodeback
Physics and Chemistry
Department

Pulse Height Analyzer Interfacing and
Computer Programming in the
Environmental Laser Propagation Project

John Robert Plett
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

An effective data interface between a Victoreen PIP-400 pulse-height analyzer and a Hewlett-Packard 9810A calculator was designed, built, and tested. A calculator program was written which enabled a research group studying laser propagation in the marine boundary layer to conduct rapid, local processing of scintillation and extinction data.

Master of Science in
Physics
June 1976

Thesis Advisor: E.A. Milne
Physics and Chemistry
Department

A Potentiokinetic Determination of
Corrosion Rates in Artificial Seawater -
Hypochlorite Solutions

Joseph Maurice Price
Lieutenant Commander, United States Navy
B.S., Illinois Institute of Technology, 1964

The corrosion rates of various metal alloys in artificial seawater and artificial seawater-CLOROX solutions was determined potentiokinetically employing the cathodic over-voltage-intercept method. The results obtained in the artificial seawater system agreed quite well with those obtained from previous ocean immersion tests. With the exception of an aluminum alloy, the effect of the addition of CLOROX was the same for all materials with the corrosion potential becoming more positive and the alloy less resistant to corrosion.

Master of Science in
Physics
June 1976

Advisor: Richard A. Reinhardt
Department of Physics
and Chemistry

A Regenerative Carbon Dioxide
Gas Dynamic Laser

Loran Ernest Rhine
Lieutenant, United States Navy
B.S., University of New Mexico, 1969

Performance improvement of a carbon dioxide gas-dynamic laser, due to regeneration, was studied theoretically. The study determined to what extent preheating the nitrogen, before mixing it with the carbon dioxide and water, would effect available laser output energy. Combustion chamber pressure and nitrogen inlet temperature were incremented by 100 psia and 300 K respectively. Due to the fact that little dissociation occurred at temperatures studied, no pressure dependence was found for the throat or combustion chamber temperatures. A method of preheating or regenerating the nitrogen is to use a gas-to-gas heat exchanger at the exhaust of the diffuser. Small signal gain was improved from 0.35 to 0.78 m^{-1} . Limiting power extraction was increased by 42%. Optimum nitrogen temperatures were determined to be 1350 K for small signal gain and 2400 K for optimum power extraction. For typical operating conditions the fractional pressure loss across the heat exchanger was found to be 0.1 atmospheres.

Master of Science in
Physics
September 1975

Thesis Advisor: Allen E. Fuhs
Mechanical Engineering
Department

An Experiment to Measure Broadband Beam
Wander and Beam Spread in the
Marine Boundary Layer

Henry William Schwartz
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1962

A system to measure the modulation transfer function of a broadband source in the marine boundary layer has been designed, constructed and tested. The system employs a stabilized black body infrared source and a high resolution scanning telescope. The telescope and ancillary detecting and recording equipment are capable of processing wavelengths from the visual out to the far infrared region of the spectrum. One successful data-recording trail was completed on 22 April 1976. The black body source was located at the Navy Beach Laboratory and the telescope optics were at the Coast Guard parking lot; a propagation range of approximately 1600 meters. Two additional successful non-recording trials were completed in the Monterey Bay testing area. Data were processed using a fast Fourier transform method. An MTF for the 3.8 micrometer broadband signal was measured.

Master of Science in
Physics
June 1976

Advisor: E. C. Crittenden, Jr.
Physics and Chemistry
Department

Electroexcitation
of Giant Resonances
Between 6.1 MeV and 38 MeV
Excitation Energy in ^{89}Y

James Okey Shannon
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

and

William Harold Smith
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

Giant resonances in ^{89}Y were studied with inelastic scattering of 92.5 MeV incident electrons at scattering angles of 75° , 90° , 105° and 120° . In the excitation energy range of 6.1 to 38 MeV, nine transitions were observed. The previously reported E1 has been verified, but the broad E2 has been separated into two distinct resonances. Reduced transition probabilities and multipolarity assignments have been made. Resonances occurred at excitation energies of 6.69 (E2), 8.09 (E2), 10.01 (E2), 11.21 (E2), 12.46 (E3), 13.63 (M2 or E3), 14.86 (E2), 16.60 (E1), 27.85 (E2).

Master of Science in
Physics
June 1976

Thesis Advisors: F.R. Buskirk
W.R. Pitthan
Physics and Chemistry
Department

X-Ray Diagnostics of Laser-Produced
Aluminum Plasmas

Sydney A. Shewchuk
Captain, Canadian Armed Forces
E.Sc. Chem. Eng., University of Alberta, 1968

Electron temperatures have been evaluated using the x-ray emission from plasmas created by irradiating a solid Aluminum target with a 500MW, 25nsec Nd laser. Studies of the x-ray emission from the plasma at $5 \times 10^{11} \text{ W/cm}^2$ using the two foil absorption method indicated temperatures ranging from 136 to 165eV. No suprathreshold activity was detected for the foil combinations used. Temperature was related to laser flux density by the scaling factor 0.404. Observed temperature remained constant for cratering with up to 25 laser pulses focused at the same spot. Preliminary measurements indicated x-ray intensity was proportional to $P^{1/4}$ over the range 10 to 300 microns.

Initial work was completed on a vacuum photodiode useful for high resolution photon detection in the soft x-ray region of the spectrum.

Master of Science in
Physics
June 1976

Advisor: A.W. Cooper
Physics and Chemistry
Department

An Analysis of Coherent Anti-Stokes
Raman Spectroscopy as an Analytical Tool

Ronald David Turner
Lieutenant, United States Navy
B.S., Auburn University, 1969

Coherent Anti-Stokes Raman Spectroscopy (CARS) is a new type of Raman Spectroscopy. The phenomenon is associated with the nonlinear conversion of two laser beams in a medium into a third collimated beam at the anti-Stokes frequency of the medium. This analysis evaluates the performance capabilities of CARS under various experimental conditions for the molecules O_2 , N_2 , H_2 and CO. Laser intensity fluctuations and shot noise are introduced as noise sources to predict signal-to-noise ratios (S/N). The S/N is evaluated as a function of the partial pressure of a gas to measure the performance of CARS. An analysis of the uncertainty in measuring the rotational temperature is presented for diatomic gases. Inverse bremsstrahlung in plasmas is investigated as a possible process by which the parameters measured by CARS might be altered. An experiment is discussed in which an attempt was made to remove the background signal inherent in most CARS experiments. Partial interferometric cancellation of two CARS signals was observed by the proper positioning of two sample cells in an otherwise standard CARS experiment.

Master of Science
in Physics
June 1976

Advisor: W. M. Tolles
Physics &
Chemistry Dept.

On a Possible Formulation of
Particle Dynamics in Terms of
Thermodynamic Conceptualizations
and the Role of Entropy In It

Pharis Edward Williams
Lieutenant, United States Navy
B.S., University of Colorado, 1968

It is shown that the laws of particle dynamics can be formulated in a thermodynamic framework. An important role is played by an integrating factor which makes the energy exchange with the environment a total differential and leads to the definition of a mechanical entropy. The integrating factor is shown to be a function of velocity only and an argument following Caratheodory's proves the existence of a unique limiting velocity which makes its appearance in the integrating factor.

Equilibrium and stability conditions for dynamic systems are derived and lead to the formulation of dynamics as processes in a space-entropy manifold the metric of which is determined by the nature of the system. The dynamic laws follow from a variational principle. For the case of isentropic processes and with a particular choice of the integrating factory they are shown to be the laws of special relativistic mechanics. More general dynamic processes are discussed.

Master of Science in
Physics
June 1976

Thesis Advisor: K.E. Woehler
Physics and Chemistry
Department

Laser Generated Magnetic Fields

Francis Thomas Williamson, Jr.
Lieutenant Commander, United States Navy
F.S., University of Wisconsin, 1966

A sequence of laser pulses focussed onto the same spot on a target produces evaporation of target material and the formation of a crater with crater depth increasing from shot to shot. An experimental study of the crater-depth dependence of the magnetic fields generated by the laser produced plasmas has been performed.

Repeated irradiation of an aluminum target with a laser pulse of 10^{12} W/cm^2 in a low background pressure of air at 10^{-5} Torr produced magnetic fields as high as 1500 G and at a rate of .055 mm/shot excavated a hole nearly 4 mm deep and 2 mm wide at the target surface. Optical micrographs were taken of the target crater surface and of craters sectioned for examination by a Scanning Electron Microscope.

An independent determination of the plasma-electron temperature was obtained from the x-ray emission continuum of the plasma.

Master of Science in
Physics
June 1976

Advisor: Fred Schwirzke
Physics and Chemistry
Department

Mission of the Soviet Surface ASW Forces:
Protection of Soviet High Value SSBN's (U)

Thomas Joseph Barry
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

Most Western observers have assumed that the primary task of the rapidly expanding Soviet Surface ASW Force was to counter the U.S. Polaris Submarines. Important inconsistencies have appeared relative to the assumed anti-Polaris Mission and this study has developed and supported a different interpretation of the Soviet ASW Mission. Broadly based evidence was found to exist, each individual piece of which was generally ambiguous in that it supported the existence of several plausible missions. The evidence consisted of, for example, the character, timing and concentration of Soviet Surface ASW exercises, the emphasis in Soviet literature on Surface ASW, the timing of Soviet ASW Ship Conversions, and other Surface ASW activity relative to the Soviet SSBN. When all of the seemingly disjointed but important evidence was correlated, a single thread which connected every piece was discernible. The Soviet Surface ASW mission which is implied by every piece of evidence examined is the one of protecting the Soviet SSBN's from a U.S. ASW threat. No other mission is as consistently supported.

Master of Science in
Systems Technology
March 1976

Advisor: R. H. Stolfi
Department of
National Security
Affairs

Consideration of the Carrier-Based
Tactical Support Center Design

Christy Lee Farris
Lieutenant, United States Navy
B.A., University of Wyoming, 1968
and

Neil John Gaffney
Lieutenant, United States Navy
B.A., Marquette University, 1967

This joint thesis analyzes the carrier-based Tactical Support Center (CV-TSC) design from a human factors engineering viewpoint. Beginning with the ASW threat to the carrier force under the CV concept, a definition of the mission of the CV/TSC is presented. System functions are identified and developed into man-machine relationships of the CV/TSC. A comprehensive, albeit general, description of TSC components is included as part of the system analysis. Man's role, functions and tasks in the CV/TSC are identified and form the basis for alternatives to the current TSC display/control console.

Master of Science in
Systems Technology
March 1967

Advisor: Douglas E. Neil
Operations Research
Department

The CPA Event, a Wave Period Processor
to Extract Doppler, and Applications

Richard Mial Fessenden
Lieutenant, United States Navy
B.S., University of Michigan, 1968

To increase tactical use of the information available as a submerged target approaches and passes a passive sensor, it was necessary to summarize the different aspects of target location fixing, develop processing techniques to extract this information in proper format, and to utilize the data in an efficient location estimation scheme.

Multipath reception at a single sensor, reception of target signature at separate sensors, and the doppler shift phenomena were investigated. It was found that doppler shift provides the most consistent and reliable information in terms of the target state but that application of the Fast Fourier Transform provides spectral frequency component amplitudes rather than instantaneous frequency. A Wave Period Processor was developed and tested to output instantaneous frequency versus time.

The Kalman Filter Data handling technique was found to be versatile, computationally simple, and adaptable, accepting a variety of input data types.

Master of Science in
Systems Technology
March 1976

Advisor: George L. Sackman
Department of
Electrical Engineering

Optimum Employment of Two
Escort Towed Array Equipped Ships
In the Support of a High Value Unit (U)

Lynden D. Lee
Lieutenant, United States Navy
B.S.C.E., Ohio Northern University, 1966

A computer program which simulates the employment of one or more towed arrays in the support of a transiting High Value Unit (HVU) was developed. The optimum stationing and speed for two escort ships equipped with the SQR-18 towed array system were found for several HVU speeds in representative sound propagation environments under various ambient noise conditions for arrays towed below the layer and submarines above and below the layer.

Master of Science in
Systems Technology

March 1976

Advisor: D.E. Harrison, Jr.
Department of
Physics and Chemistry

A Feasibility Study for a Magnetic
Anomaly Detection (MAD) Test Range

Dennis Alexander Pignotti
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1964

Timothy Paul Winters
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1967

The purpose of this study was to determine the feasibility of a MAD test range, to suggest some basic guidelines to be considered in setting up the range, and to propose some uses for this type of range.

Master of Science in
Systems Technology
March 1976

Advisor: R. N. Forrest
Department of
Operations Research
and Administrative
Sciences

A Comparison of the Signals Received by a
Magnetometer Mounted on an Aircraft
Flying Circular Patterns versus
Straight Line Paths

Phillip Lance Reed
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1965

Joseph Leo Harford
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1968

The purpose of this thesis was to determine the magnetic anomaly signals received by a magnetometer mounted on an aircraft while flying circular flight paths with radii of 2000 and 4000 meters and to compare the signals with those received while flying straight line flight paths.

The results of the analysis revealed that, close to CPA, no significant difference existed in wave shape between the signals received during the two types of encounters. However, at distances of greater than one track offset on either side of CPA the signals from the two types of encounters in some cases varied significantly in both waveshape and magnitude.

Master of Science in
Systems Technology
March 1976

Advisor: R. N. Forrest
Department of Operations
Research and Administrative
Sciences

Modeling Geologic Noise
for
M.A.D. Applications

John Joseph Sheridan
Lieutenant, United States Navy
B.S.M.E., Manhattan College, 1968

and

William Fraser Burdick, Jr.
Lieutenant, United States Navy
B.S.E.E., North Carolina State University, 1969

The purpose of this thesis was to develop and test a model of geologic magnetic noise for MAD applications with total field magnetometers. From analysis of ocean floor characteristics and rock magnetism a model was chosen which was, in essence, a two-dimensional distribution of magnetic monopoles. Data from P-3 aircraft magnetic tape recordings of geologic noise were to be compared with the model, however this analysis was not completed due to difficulties in reading the data from the tape and in removing the earth's field gradient from the data.

Master of Science in
Systems Technology
March 1976

Thesis Advisor: G. L. Sackman
Electrical Engineering
Department

Surface Escort Countermeasures
to
High Performance Acoustic Torpedoes

Richard Jonathan Staley
Lieutenant Commander, United States Navy
B.A., Occidental College, 1963

(U) A plausible torpedo threat to a surface escort is presented and the means by which it might be detected and classified are investigated. A review is then conducted of past efforts at non-acoustic and acoustic torpedo countermeasures and explosive neutralization, and the position is taken that the latter techniques hold the greatest potential for a successful defense. Two neutralization schemes which have appeared in a number of variants in past designs are expanded upon and weighted for effectiveness. A determination is made that some form of an anti-torpedo torpedo would prove more effective than a pattern of launched charges in countering an active acoustic homing torpedo.

Master of Science in
Systems Technology
March 1976

Advisor: A. R. Washburn
Department of Operations
Research & Administrative
Sciences

Torpedo Tracking Using an Onboard
Navigation System

Arch Edward Taylor
Lieutenant, United States Navy
B.S., Purdue University, 1970

The present method of testing torpedoes on fixed ranges does not provide a sufficiently wide variety of environments to be considered optimum for realistic evaluation of torpedo performance. A mobile at-sea range would help with this problem. A method which provides some of the advantages of a mobile open ocean torpedo tracking range through the use of an inertial navigation system (INS) is proposed. The results of some performance calculations indicate that, although this concept cannot yield the same accuracy as that of the fixed ranges, given certain tasking and cost requirements this testing approach may be useful.

Master of Science in
Systems Technology
March 1976

Advisor: O. B. Wilson, Jr.
Department of
Physics and Chemistry

The LRCM:
Asymmetries, Deterrence and SAL

Darold Steven Axtman
Lieutenant Commander, United States Navy
B.S., North Dakota State University, 1963

This paper examines the many factors surrounding the potential deployment of the long-range strategic cruise missile focusing on: the technical and strategic asymmetries including guidance systems, air defense forces, nuclear weapons targeting vulnerabilities and strategic weapons essential equivalence; strategic implications including the missile's impact on the strategic balance and its potential stabilizing influence on a deterrence model; and implications on Strategic Arms Negotiations.

It examines how the long-range cruise missile will add a measure of stability to the strategic deterrent balance and contribute to the restrained counterforce doctrine. The sea-launch cruise missile platform would provide a non-time sensitive reserve weapon capable of inflicting unacceptable damage on the adversary, hence increasing the stability of deterrence.

Master of Arts in
Naval Intelligence
March 1976

Advisor: William Reese
Physics and Chemistry
Department

Third Party Involvement in International
Terrorist Extortion

Ralph William Connelly
Lieutenant, United States Navy
B.A., Jacksonville University

This thesis examines the hypothesis that when international terrorists conduct successful extortionary events, they are encouraged to carry out similar events.

The thesis contains a methodology for collecting information about extortionary terrorist events in a format suitable for aggregate data analysis. This methodology was used for recording data on all international terrorist extortionary events which could be found for the period 1968-1975. Bivariate analysis was used in an effort to reveal the determinants of terrorist success in kidnappings, hijackings, and barricade incidents. It was found that the variables which contribute to terrorist success are so interrelated that no single determinant of terrorist success could be isolated. Tests of the hypothesis were unable to produce conclusive results. Whether or not terrorist success encourages further terrorist extortionary activity could not be proven in this study.

Master of Arts in
Naval Intelligence
March 1976

Advisor: Russel H. Stolfi
Government Department

Training and Education of Soviet Naval Personnel
and the Impact on Readiness

Gloria J. Darnstaedt
Lieutenant, United States Navy
B.S., Wright State University, 1969

With the advent of venturing farther and farther from her own shores, the Soviet Navy had to modernize and expand its fleets and to update and revise the education and training of its personnel. This paper looks at the latter area. Using openly published Soviet military literature as the primary source of information, this paper describes and analyzes the impact on naval readiness of the 1968 law for Universal Military Service, civilian military training, training and education of Soviet sailors and officers, and shipboard training. From the foregoing, it appears that Soviet naval training and education practices have not kept up with the requirements of the "new" navy. The Soviets are not neglecting the noted shortcomings, however, and time will be the major factor in overcoming their present problems.

Master of Arts in
Naval Intelligence
March 1976

Advisor: D. C. Daniel
National Security
Affairs Department

Arab Perceptions of the 1967 War

Frank Leonard Holland, Jr.
Lieutenant, United States Navy
A.E., Southern Technical Institute, Division of the
Georgia Institute of Technology, 1969
A.B., West Georgia College, 1971

A number of studies have shown that the relationship between perceptions and decision-making is a vital one; therefore, there is little doubt that the Arab perceptions of the 1967 War played an important role in the decision-making both during the war and in the post-war years. The June 1967 war is analyzed from the Arab viewpoint; the study seeks to discover the Arab perceptions of the conflict. Arab subjective interpretation of the war is presented in order to contrast the Arab perceptions of various events with the demonstrated reality. The thesis provides insights into the Arab perceptions of the war by examination of the Arab appraisals of their successes and failures. This study presents on two levels - social and political - the general perceptions of Arab individuals, groups, and states about the 1967 war. To accomplish these socio-political levels of analysis, the study breaks the general Arab perceptions down into the specific areas of personal, military, and national perceptions.

Master of Arts
Naval Intelligence
March 1976

Advisor: John W. Amos
National Security
Affairs Department

The Impact of the Arab Decision-Makers
On The Oil Market

by

Lee Blanton Hull
Lieutenant, United States Navy
B.A., Ohio Wesleyan University, 1969

This thesis examines the political arena of the oil industry, and the decision-makers of the Arab oil countries. The two primary areas of study are OPEC and the various political relationships, both inter-Arab and Arab-Western. The oil weapon strategies are analyzed as a form of deterrence.

The main hypothesis is that these countries have three options available in which to utilize their oil weapon: embargo; production slow down; and price fixing and raising. The potential of each option is analyzed in detail based on the attitudes, goals, reactions and various oil market roles of the countries involved. The conclusion reached is that, with only those three options available, the oil weapon is becoming less of a credible deterrent. Only total embargo currently remains as a plausible option. Both sides are beginning to realize that an equilibrium state of supply and demand is the only realistic alternative to ensure that all parties derive maximum benefit from an expendable resource.

Master of Arts in
Naval Intelligence
March 1976

Advisor: John W. Amos, II
National Security
Affairs Department

Measuring Aircraft Capability for
Military and Political Analysis

Allan Wesley LeGrow
Lieutenant, United States Navy Reserve
B.A., Bowdoin College, 1970

This thesis explores the question of measuring weapons capability for application in arms transfer studies and military analysis. A review of common theories and methods of scaling and a discussion of measurement techniques currently used in arms transfer research, provide background information for the sections on capability measurement.

Two conceptual approaches to capability are developed and the problems of measuring capability discussed. A discussion of possible ways to measure capability follows and four scaling techniques presented; factor analysis; paired comparisons; successive intervals; and multi-attribute utility scaling. After clarifying their theoretical bases, strengths, and weaknesses, each method is used to scale aerial combat capability in fighter aircraft.

One major conclusion reached is that judgemental scaling techniques are presently more valuable for measuring capability than more computerized procedures such as factor analysis. A second conclusion is that multi-attribute utility scaling affords the best opportunity for ratio comparisons of weapon capability.

Master of Arts in
Naval Intelligence
March 1976

Thesis Advisor: E.J. Laurance
National Security Affairs
Department

Nuclear Theft: Real and Imagined Dangers

Robert Caldwell Mabry, Jr.
Lieutenant, United States Navy
B.A., Monmouth College, 1970

Nuclear Theft: Real and Imagined Dangers, examines the possibility of theft of fissionable material from the U.S. nuclear power industry by non-governmental individuals or groups. The study investigates the availability of fissionable material, vulnerable portions of the nuclear fuel cycles, weapon construction, and the regulations regarding the protection of fissionable material. The study uses a morphological approach to evaluate the capability of potential thieves by group size and classification. Possible motivations for committing nuclear theft are discussed.

Master of Arts in
Naval Intelligence
March 1976

Advisor: R. H. Stolfi
Department of
National Security
Affairs

Japan's Foreign Policy:
Metamorphosis in Asia

April Doreen Mohr
Lieutenant, United States Navy
B.A., University of South Florida, 1969

Japan's traditional post war policies are becoming increasingly more autonomous from those of the U.S., despite the fact that her defense policy remains linked to the U.S.-Japan Security Treaty. The alternatives open to Japan are diverse, each with a wide range of effects, but the validity of the U.S. commitment will be the chief determinant of the option selected. Nearly every element of Japan's post-war policies has been dictated by the need to guarantee her economic viability. Her post-war defense posture, despite internal and external pressures, has been predicated upon a policy of absolute minimum defense. A major factor in Japan's move towards independence is her new relation with the Asian nations, specifically, the PRC and the USSR and the countries she considers to be primary threats to her security - Korea and Taiwan. Japan's future policy alternatives encompass a wide range of options, each dependent upon a given set of circumstances or events which could conceivably make any one policy choice inevitable.

Master of Arts in
Naval Intelligence
March 1976

Thesis Advisor: F. M. Teti
National Security
Affairs Department

The Patrol Boat Navy:
An Emergent Force in the Mediterranean

Eugene Thomas Oatley
Lieutenant, United States Navy
B.A., Florida State University, 1970

The fifteen year period since 1960 has witnessed a rapid growth in the small navies of the southern and eastern Mediterranean littoral countries. The advent and introduction into the area of the missile-firing fast patrol boat has given a new dimension to the overall balance of forces structure as well as expanding the potential roles of naval units in future hostilities. Additionally, the presence of U.S. and Soviet combatants has created an international arena from which the possibilities of potential conflict have grown alarmingly real.

The study makes a comparative evaluation of the naval order of battle for nine Middle East and North African States with emphasis on the degree to which reliance on fast patrol craft has been placed. An examination of factors contributing to the development of patrol boat navies is offered with particular attention given to the Arab-Israeli Conflict, Foreign Power Interests, and the move for Arab Independence. Finally, the study serves to illustrate the threat posed by missile-armed patrol craft in emerging navies world-wide.

Master of Arts in
Naval Intelligence
March 1976

Advisor: John W. Amos II
Government Department

The Impact of the October War
on
Super-Power Middle East Policy

Allan Edward Rypka
Lieutenant Commander, United States Navy
B.A., University of Minnesota, 1964

This thesis analyzes the impact of the October 1973 Middle East War on super-power Middle East policy. The analysis is conducted within the context of the overall Middle East crisis, both before and after the 1973 War.

Consideration is given to the historical roles of the US and USSR in the Middle East to highlight the changes in those roles as a result of the War. New patterns of super-power involvement in the area are described and the potential effects of these patterns on future Middle East developments are projected.

Master of Arts in
Naval Intelligence
March 1976

Thesis Advisor: J. W. Amos
Government
Department